Catalog of Nearby Exoplanets[1]

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ABSTRACT

We present a catalog of nearby exoplanets. It contains the 172 known low-mass companions with orbits established through radial velocity and transit measurements around stars within 200 pc. We include 5 previously unpublished exoplanets orbiting the stars HD 11964, HD 66428, HD 99109, HD 107148, and HD 164922. We update orbits for 90 additional exoplanets including many whose orbits have not been revised since their announcement, and include radial velocity time series from the Lick, Keck, and Anglo-Australian Observatory planet searches. Both these new and previously published velocities are more precise here due to improvements in our data reduction pipeline, which we applied to archival spectra. We present a brief summary of the global properties of the known exoplanets, including their distributions of orbital semimajor axis, minimum mass, and orbital eccentricity.

Subject headings: catalogs — stars: exoplanets — techniques: radial velocities

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1. Introduction

It has now been more than 10 years since the discovery of the first objects that were identified as planets orbiting normal stars. The epochal announcement in 1995 October of 51 Peg b (Mayor & Queloz 1995) was confirmed within a week (Marcy et al. 1997) and followed within 2 months by two other planets — 47 UMa b and 70 Vir b (Butler & Marcy 1996; Marcy & Butler 1996). The unexpected diversity and mass distribution of exoplanets was represented well by those first three planets, as the first one orbits close-in, the second orbits beyond 2 AU, and the last resides in a very eccentric orbit. The paucity of companions having larger masses, with $M \sin i$ between 10-80 M_{JUP}, suggested a mass distribution separated from that of stars, rising with decreasing mass and peaking below 1 M_{Jup}(Marcy & Butler 2000; Halbwachs et al. 2000; Udry, Mayor, & Queloz 2003).

During the past 10 years, over 160 exoplanet candidiates have been identified orbiting stars within 200 pc, and most have been detected by Doppler search programs based at the Keck, Lick, and Anglo-Australian Observatories (the California & Carnegie and Anglo-Australian planet searches, e.g. Butler et al. 1996; Tinney et al. 2001) and teams based at l'Observatoire de Haute Provence and La Silla Observatory (the Geneva Extrasolar Planet Search, e.g. Mayor & Santos 2003). Other Doppler programs have contributed important discoveries of nearby planets (Cochran et al. 1997; Endl et al. 2003; Noyes et al. 1999; Kürster et al. 2003; Charbonneau et al. 2000; Sato et al. 2005). One nearby planet, TrES-1, has been discovered by its transit across the star (Alonso et al. 2004).

Here we present a catalog of all known exoplanets that reside within 200 pc, containing the vast majority of well-studied exoplanets. This distance threshold serves several purposes. First, nearby planets and their host stars are amenable to confirmation and follow-up by a variety of techniques, including high resolution imaging and stellar spectroscopy with high signal-to-noise ratios, and astrometric follow up (e.g. Benedict et al. 2001; McArthur et al. 2004). In addition, milliarcsecond astrometry for planet-host stars within 200 pc can provide precise distance estimates, and most planet search target stars within 100 pc already have parallaxes from Hipparcos (Perryman & ESA 1997). Thirdly, nearby planet-host stars are bright enough to permit precise photometric and chromospheric monitoring by telescopes of modest size, permitting careful assessment of velocity jitter, starspots, and possible transits, e.g., Henry (1999); Henry et al. (2000); Queloz et al. (2001); Eaton, Henry, & Fekel (2003).

This paper updates the last published list of exoplanets (Butler et al. 2002). The growth of the field is reflected by the discovery of over 100 planets in the 3 years since the publication of that list of 57 exoplanets.

About a dozen exoplanet candidates have been discovered that reside beyond 200 pc, including a half dozen in the Galactic bulge found in the OGLE survey and a few other planets found by microlensing (e.g. Torres et al. 2003; Konacki et al. 2003; Bouchy et al. 2005a). Perhaps most notable are the first planets ever found outside our Solar System, orbiting a pulsar (Wolszczan & Frail 1992). Such distant planets reside beyond the scope of this catalog.

We include known companions with minimum masses ($M \sin i$) up to 24 M_{Jup}. This is well above the usual 13 M_{Jup} deuterium-burning limit for planets adopted by the IAU. We do this for for two reasons. First, uncertainties in stellar mass and orbital inclination complicate the measurement of sufficiently precise masses to apply a robust 13 M_{Jup} cutoff. Secondly, there is little or no evidence indicating that such a cutoff has any relevance to the formation mechanisms of these objects. We therefore use a generous minimum mass criterion for inclusion in this catalog, and decline to choose a precise definition of an "exoplanet".

Two other planet candidates were detected by direct imaging, 2M1207 b (Chauvin et al. 2004), and GQ Lup b (Neuhäuser et al. 2005). We exclude these from the tabular catalog due to their considerably uncertain orbital periods, eccentricities, and masses. Similarly, we exclude many Doppler-detected planets due to their lack of data spanning one full period, which precludes a secure determination of their orbits and minimum masses.

One might question the value of a catalog of exoplanets in the face of such rapid discovery. Without question, the catalog presented here will become out of date before it is printed.[1] However, this catalog offers many attributes of unique value. First, it contains updated orbital parameters for 90 exoplanets, computed anew from our large database of Doppler measurements of over 1300 stars from the Lick, Anglo-Australian, and Keck Observatories obtained during the past 18, 7, and 8 years respectively (Butler et al. 2003; Marcy et al. 2005a). These new orbital parameters significantly supersede the previously quoted orbital parameters in most cases.

Second, we use the latest estimates of stellar mass to improve the precision of the minimum planet mass, $M \sin i$(Valenti & Fischer 2005). Thirdly, the catalog contains Doppler measurements for the planet host stars in our database, allowing both further analyses of these velocities and novel combinations with other measurements. The publication of this archive foreshows a forthcoming work (Wright et al., 2006, in prep) which will identify and

[1] Note added in proof: Indeed, after submission this paper Lovis et al. (2006) announced a triple-Neptune system orbiting HD 69830, Hatzes et al. (2006) confirmed a 2.3 M_{Jup} planet orbiting Pollux, J. T. Wright et al. (in preparation) announced a planet orbiting HD 154345 and a second planet orbiting HIP 14810, and J. A. Johnson et al. (in preparation) announced a hot Jupiter orbiting HD 185269. Our group will maintain an up-to-date version of the Catalog of Nearby Exoplanets on the World Wide Web at http: //exoplanets.org

catalog prospective exoplanets and substellar companions of indeterminate mass and orbital period. Finally, the catalog will serve as an archive of known nearby exoplanets and their parameters circa 2005. The catalog may serve ongoing exoplanet research, both observation and theory, and provide useful information for future exoplanet studies of nearby stars.

2. Data

The radial velocity data here come from three sources: observations at Lick Observatory using the Hamilton spectrograph (Vogt 1987), at Keck Observatory using HIRES (Vogt et al. 1994), and at the 3.9 m Anglo-Australian Telescope using UCLES (Diego et al. 1990). These instruments, their characteristics, and typical uncertainties in the radial velocities they produce are discussed in the discovery papers of the exoplanets planets found with them (in particular Fischer et al. 1999; Butler et al. 1998; Tinney et al. 2001). We explicitly note here upgrades over the years which have significantly improved their precision at typical exposure times: the Hamilton spectrograph was upgraded in November 1994, increasing the precision of a typical observation from $10 - 15$ ms^{-1} to ~ 4 ms^{-1}. In August 2004 HIRES was upgraded, increasing the precision of a typical observation from ~ 3 ms^{-1}to ~ 1 ms^{-1}. The precision of UCLES data is $2 - 3$ ms^{-1}.

We have also revised our entire reduction pipeline, including an overhauled raw reduction package which includes corrections for cosmic rays and an improved flat-fielding algorithm, a more accurate barycentric velocity correction which includes proper-motion corrections, and a refined precision velocity reduction package which includes a telluric filter and a more sophisticated deconvolution algorithm. We also now correct for the very slight non-linearity in the new HIRES CCD. We have improved the characterization of the charge transfer inefficiency in the old CCD which limited its precision to ~ 3 ms^{-1}, a problem not present in the new chip.

In previous works we have subtracted a constant velocity such that the median velocity of the set was zero (since these are differential measurements, one may always add an arbitrary constant to the entire set). Here, we have applied an offset to the data so that the published orbital solution has $\gamma = 0$, where γ is the radial velocity of the center of mass of the system.

For the above reasons the measurements listed here are more precise and accurate than the values given in our previous publications, and will not exactly match the values given in those works. There may also be slight differences in the binning of measurements made within about two hours of one other.

3. Radial Velocities

In the table of radial velocities for our stars (available in the electronic edition of the *Journal*), we report the time of observation, measured radial velocity, and formal uncertainty in each measurement. The uncertainties reported are measured from the distribution of velocities measured from each of 400 parts of each spectroscopic observation, as discussed in previous works (e.g. Marcy et al. 2005b), and do not include jitter. We present a sample of this data set in Table 1.

Table 1. Radial Velocities for Planet Bearing Stars

Star Name	Time (JD-2440000)	Velocity (m s^{-1})	Uncertainty (m s^{-1})	Observatory
HD 2039	11118.057282	14.5	8.5	A
HD 2039	11118.960972	-9	15	A
HD 2039	11119.944525	3	11	A
HD 2039	11121.038461	0	14	A
HD 2039	11211.951424	-24	16	A
HD 2039	11212.923368	-11	11	A
HD 2039	11213.974942	-8	15	A
HD 2039	11214.917072	-14	10	A
HD 2039	11386.322743	-29	15	A
HD 2039	11387.298102	-16	11	A

Note. — [The complete version of this table is in the electronic edition of the Journal. The printed edition contains only a sample.]

The table contains five columns. The first contains the name of the star. The second contains the time of observation as a Julian date. The third contains the measured precision radial velocity at that time, and the fourth, the uncertainty in this measurement. The final column contains a key indicating which observatory made the observation: 'K' for Keck Observatory, 'A' for the AAT, and 'L' for Lick Observatory.

In addition to the uncertainties published here, there are known sources of error associated with astrophysical jitter, the instrument, and the analysis. These sources combine to give an additional source of noise, collectively termed "jitter". The magnitude of the jitter is a function of the spectral type of the star observed and the instrument used. Wright (2005) gives a model (for stars observed before August 2004 at Keck) that estimates, to within a factor of roughly 2, the jitter for a star based upon a star's activity, color, $T_{\rm eff}$, and height above the main sequence. More recent measurements on HIRES will have less jitter due to the improved characteristics of the new CCD. Nonetheless, we adopt this model as an additional source of noise for all observations at all telescopes. We report these adopted jitter values in Table 2

4. Errors

We calculated uncertainties in orbital parameters through the following method, described in Marcy et al. (2005b): We subtracted the best-fit orbital solution from the data and interpreted the residuals as a population of random deviates with a distribution characteristic of the noise in the data. We randomly selected deviates from this set, with replacement, and added this "noise" to the velocities calculated from the best-fit solution at the actual times of observation. We then found the best-fit orbital solutions to this mock data set. Repeating this procedure 100 times, we produced 100 sets of orbital parameters. We report the standard deviation of each individual parameter over the 100 trials as the 1σ errors listed in Table 3. For the derived quantities a and $M \sin i$, we calculated these quantities from each mock data set and report the standard deviation in those quantities propagated with an assumed error of 10% in the stellar mass (which dominates the error budget for many planets).

Uncertainties in e and ω become non-Gaussian when $\sigma_e \gtrsim e/2.$; in particular ω and σ_ω become ill-defined when $e = 0$. In order to report uncertainties in an intuitive manner, we calculate σ_e in such cases as the geometric mean of $\sigma_{e \cos \omega}$ and $\sigma_{e \sin \omega}$. In other words, for cases when $\sigma_e \gtrsim e/2.$, we effectively model the uncertainties as a 2-d Gaussian in $(e \cos \omega)$-$(e \sin \omega)$-space where the values of e and ω reported in Table 3 are the coordinates of the center of the Gaussian, and the error in e is its width.

For succinctness, we express uncertainties using parenthetical notation, where the least significant digit of the uncertainty, in parentheses, and that of the quantity are understood to have the same place value. Thus, "0.100(20)" indicates "0.100 ± 0.020", "1.0(2.0)" indicates "1.0 ± 2.0", and "1(20)" indicates "1 ± 20".

Spectroscopic parameters from SPOCS (Valenti & Fischer 2005) have typical errors of 44 K in $T_{\rm eff}$, 0.06 dex in $\log g$, 0.03 dex in [Fe/H], and 0.5 $\rm kms^{-1}$ in $v \sin i$. Errors in the corresponding parameters from Santos, Israelian, & Mayor (2004) and Santos et al. (2005) are 50 K, 0.12 dex and 0.05 dex, respectively ($v \sin i$ is not quoted in these sources). We quote errors in parameters from other sources explicitly.

5. Stellar Properties

Table 2 represents a compilation of data on the properties of the host stars for the nearby exoplanets. Columns 1-2 list the HD and Hipparcos numbers of the stars, and column 3 acts as a gloss for stars with Flamsteed, Bayer, or commonly used Gliese designations (e.g. 51 Peg, υ And, GJ 86), many of which appear in Table 3.

Hipparcos (ESA 1997) provides accurate distances and positions to all stars in this catalog save two, BD -10°3166 and the host star of TrES-1. We quote coordinates, $B-V$, V magnitude, and distance to stars from the Hipparcos catalog in columns 4-8.

Columns 9-13 contain $T_{\rm eff}$, log g, abundance, $v \sin i$, and mass for these stars, collected from the references listed in column 14. Most of these reported values come from the SPOCS catalog, (Valenti & Fischer 2005), whose measurements are based on detailed spectroscopic analysis and evolutionary models, and the catalogs of Nordström et al. (2004), Santos, Israelian, & Mayor (2004) and Santos et al. (2005),

Column 15 lists Mount Wilson S-values for many of the stars, most of which are drawn from Wright et al. (2004), Tinney et al. (2002), and Jenkins et al. (2005), but some of which are new to this work, measured in the manner described in Wright et al. (2004). Column 16 lists the height of the star above the main sequence, $\Delta M_{\rm V}$ (a function of $M_{\rm V}$ and $B-V$ defined in Wright 2004). Column 16 lists the jitter predicted by the model of Wright (2005) for those stars for which we have updated orbital parameters. We have added these jitter values in quadrature to the formal uncertainties when fitting for the orbital parameters listed in Table 3. This procedure is also discussed in Marcy et al. (2005b).

6. Catalog of Nearby Exoplanets

Table 3 presents the Catalog of Nearby Exoplanets. For planets with recently published velocities and orbits (e.g. the HD 190360 system in Vogt et al. (2005)) or those for which we have insufficient data for an orbital fit or no data at all (e.g. HD 1237 b), we quote the most recently published solution. For all others, the orbital parameters in Table 3 represent the best-fit orbital solutions to the velocities in Table 1.

The name of each host star appears once for each system of planets in the first column. Where available, we use Bayer designations or Flamsteed numbers to identify a star (e.g. 51 Peg, not HD 217014) since these names are more mnemonic than HD and Hipparcos catalog numbers, which are cross-referenced in Table 2. For stars with no HD number, (e.g. GJ 86), we use the most common designation in the literature. The second column gives the component name (*b*, *c*, etc.) of each planet. Component names are ostensibly assigned in order of discovery.

Columns 3-9 report the parameters of a best-fit solution to the observed radial velocities: P, the sidereal orbital period of the planet in days; K the semi-amplitude of the reflex motion of the star in m s^{-1}; e, the eccentricity of the planet's orbit; ω, the longitude of periastron of the planet's orbit in degrees; T_{p}, the time of periastron passage as a Julian Date; T_{t}, the mid-time of transit assuming $i = 90°$; and the magnitude of a linear trend (in m s^{-1}) subtracted from the velocities required to achieve the fit. We have excluded T_{p} values for those fits where the eccentricity has been fixed at 0, except in cases collected from the literature where $\omega = 0$ arbitrarily. We have not calculated T_{p} or T_{t} values for orbital parameters collected from the literature, but we report them where present. Parameters for dynamical fits in Table 3 from the literature may use slightly different definitions of these parameters, using Jacobi coordinates and synodic periods (e. g. Rivera et al. 2005).

Columns 10 and 11 contain the minimum mass ($M \sin i$) and orbital radius (a) of the planet, calculated from the orbital parameters and the mass of the host star ($M_\star$ given in Table 2) using the following definitions:

$$M \sin i = K\sqrt{1-e^2}\left(\frac{P(M_\star + M\sin i)^2}{2\pi G}\right)^{1/3} \tag{1}$$

$$\left(\frac{a}{\mathrm{AU}}\right)^3 = \left(\frac{M_\star + M\sin i}{M_\odot}\right)\left(\frac{P}{\mathrm{yr}}\right)^2 \tag{2}$$

where G is the gravitational constant.

Columns 11 and 12 report the quality of the fit as the r.m.s. of the residuals and reduced chi-square χ^2_ν for the appropriate number of degrees of freedom., and column 13 reports the number of observations used in the fit. Column 14 contains the reference for the quantities in columns 3-8, 11, 12, and 13. For many planets (e.g. 51 Peg b), other groups have published an orbital solution independent of ours. In these cases, we cite the most recent such solution parenthetically in column 14. When this independent solution is of comparable quality to that in Table 3, we reproduce it in Table 4.

7. New exoplanets

We announce here five new exoplanets, HD 11964 b, HD 99109 b, HD 66428 b, HD 107148 b, HD 164922 b. Their orbital parameters and the properties of their host stars are listed among the other entries in the tables below. The data for these detections were obtained at Keck Observatory. All of these exoplanets orbit inactive stars ($\log R'_{\rm HK} < -5$) which are metal-rich ([Fe/H] > 0.1).

HD 11964 is somewhat evolved, sitting two magnitudes above the main sequence. The fit for HD 11964 b is good, but the 5.3 m s^{-1} residuals are comparable to the 9 m s^{-1} amplitude, making the exoplanetary interpretation of the velocity variations somewhat in doubt.

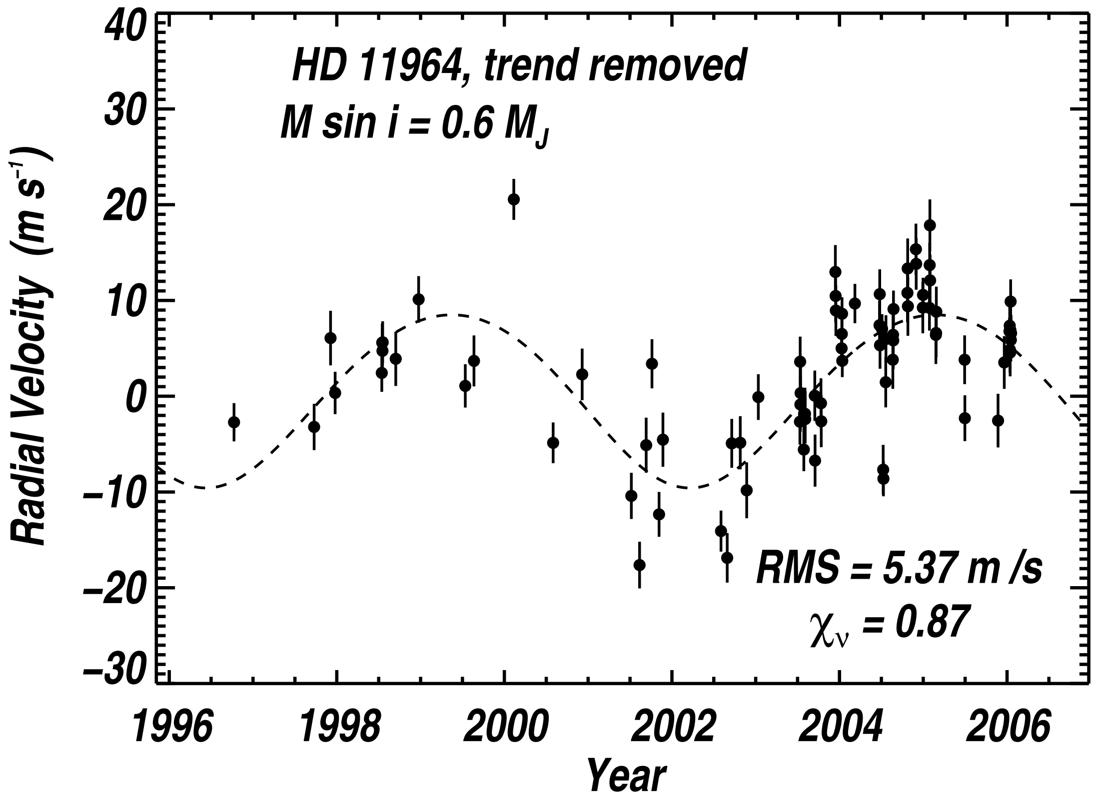

Fig. 1.— Best-fit orbit to the radial velocities measured at Keck Observatory for HD 11964, with $P = 5.8yr$, $e \sim 0$, and $M \sin i = 0.6\mathrm{M_{Jup}}$.

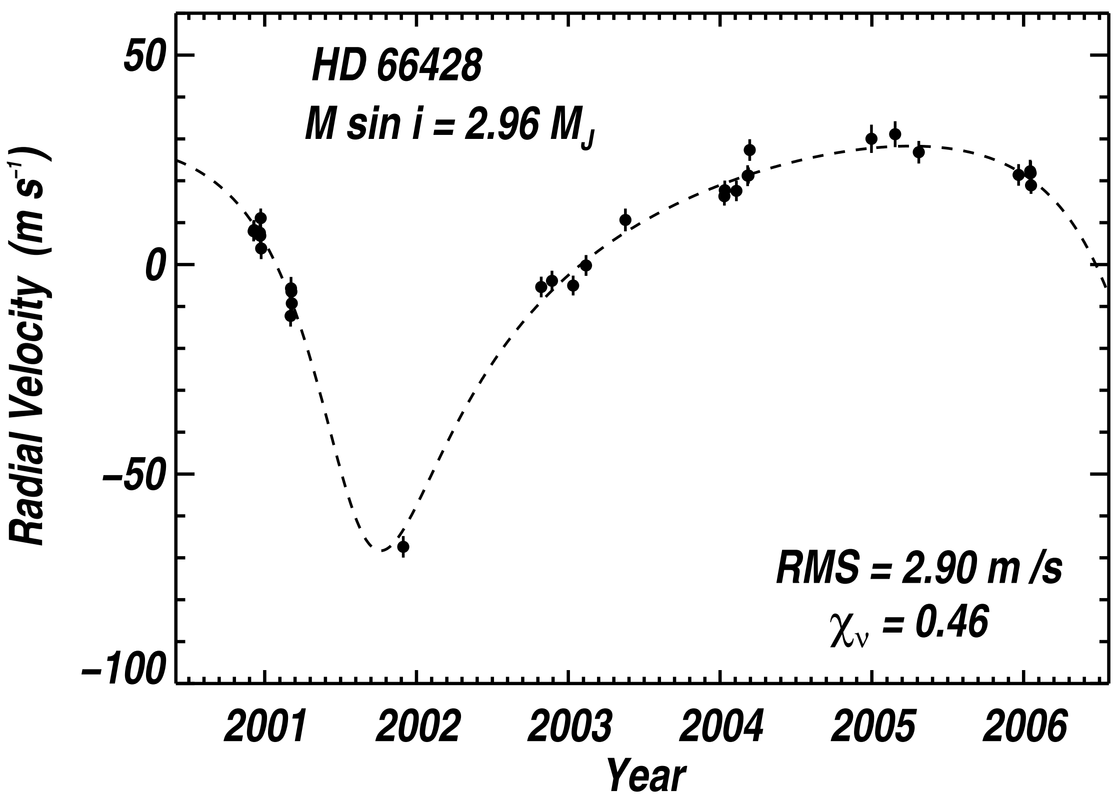

Fig. 2.— Best-fit orbit to the radial velocities measured at Keck Observatory for HD 66428, with $P = 5.4yr$, $e = 0.5$, and $M \sin i = 3\mathrm{M}_{\mathrm{Jup}}$.

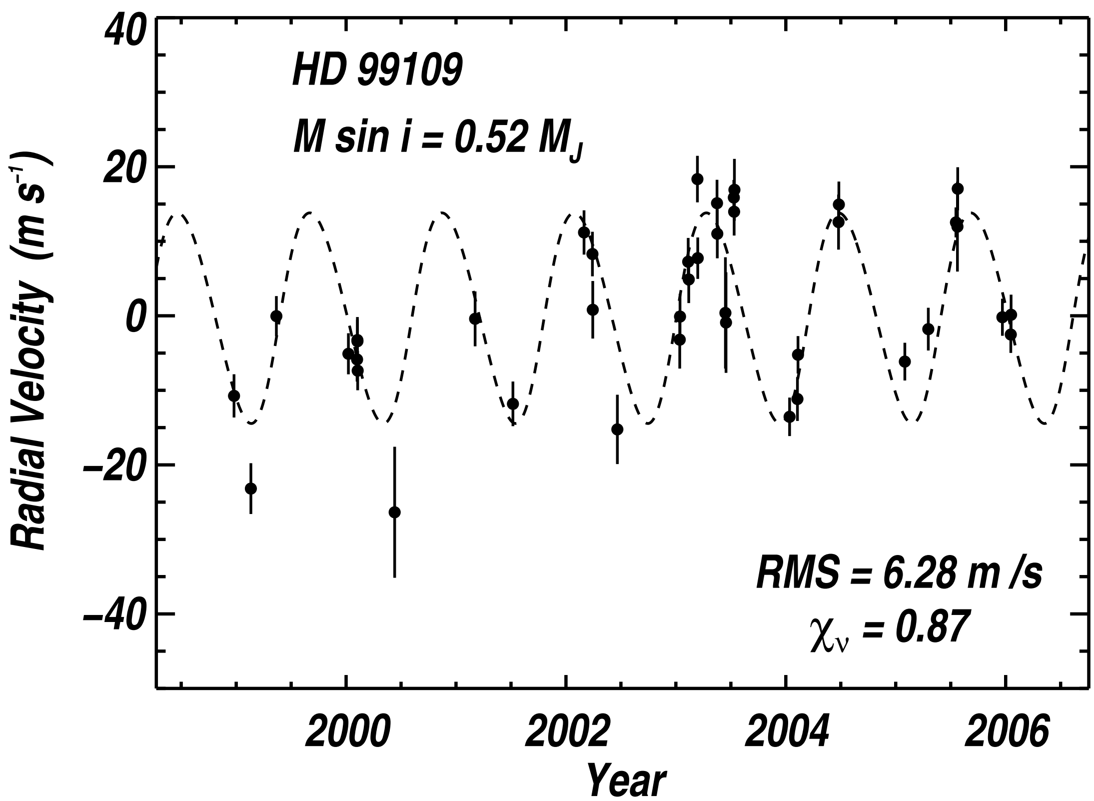

Fig. 3.— Best-fit orbit to the radial velocities measured at Keck Observatory for HD 99109, with $P = 1.2yr$, $e \sim 0$, and $M \sin i = 0.5\mathrm{M_{Jup}}$.

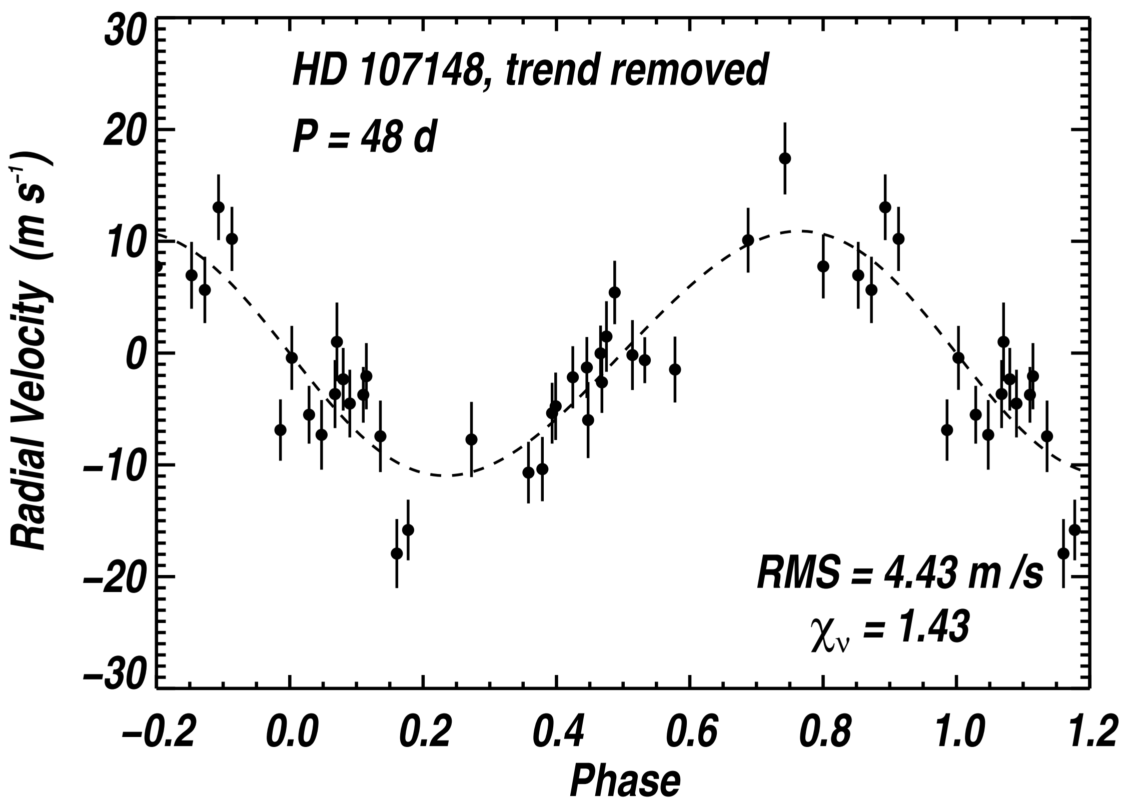

Fig. 4.— Best-fit orbit to the radial velocities measured at Keck Observatory for HD 107148, with $P = 48d$, $e \sim 0$, and $M \sin i = 0.2\mathrm{M}_{\mathrm{Jup}}$.

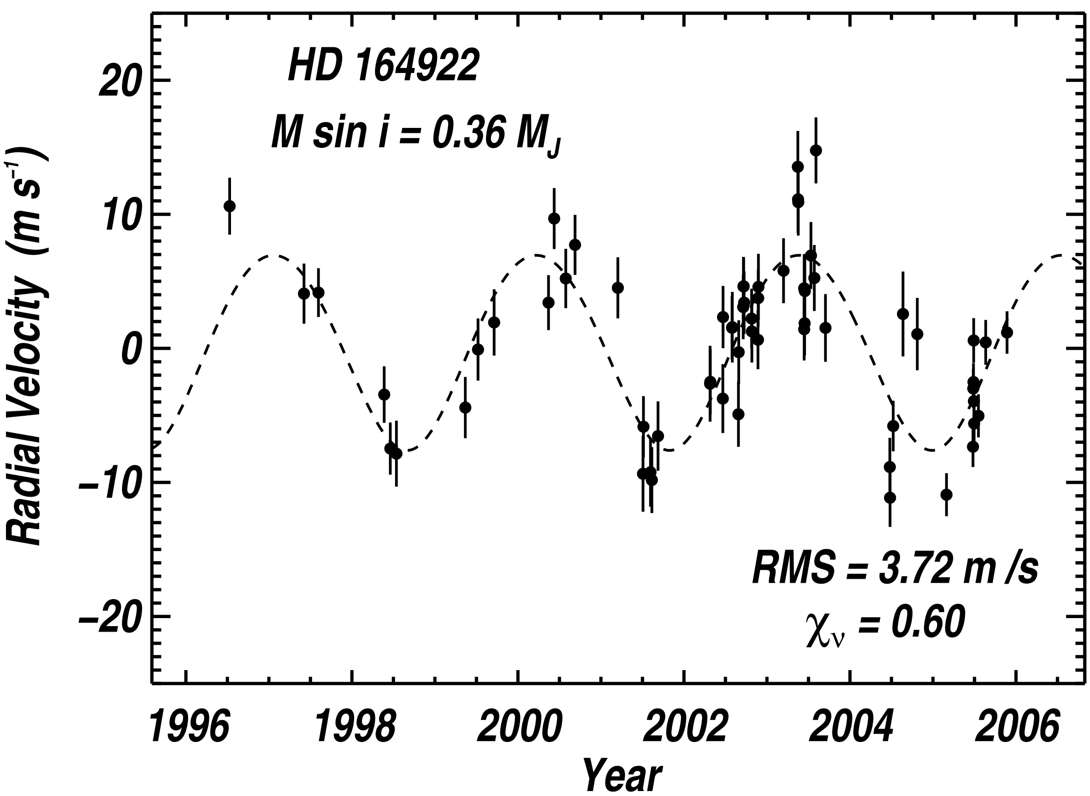

Fig. 5.— Best-fit orbit to the radial velocities measured at Keck Observatory for HD 164922, with $P = 3.2yr$, $e \sim 0$, and $M \sin i = 0.4\mathrm{M}_{\mathrm{Jup}}$.

8. Discussion

For many exoplanets we find an improved orbital solution when we superimpose a linear trend and the velocity curve. Such systems likely contain additional companions of indeterminate mass and orbital periods substantially longer than the span of the observations. When such systems are observed long enough that the radial velocity signature of these more distant companions begin to deviate from a linear trend, these fits naturally become poor, even though double-Keplerian fits remain poorly constrained.

An excellent example is HD 13445 b, which shows a strong trend of ~ -95 ms^{-1}, consistent with the presence of a massive companion beyond 4 AU. The poor quality of the fit ($\sqrt{\chi^2_\nu} = 2.1$) may indicate curvature in the signal of the massive companion — indeed a double-Keplerian fit with an outer planet with $P > 10$ yr produces a fit with an r.m.s. of 4 ms^{-1}. This may be consistent with reports of a massive companion at 20 AU (Eggenberger, Udry, & Mayor 2003; Els et al. 2001). A second example is HD 68988, where the r.m.s. of the residuals of a double-Keplerian are 3.3 ms^{-1}, down from 6.4 ms^{-1} for a single Keplerian plus trend model. In both of these cases the mass and period of the more distant companion are under-constrained, so the planetary nature of the companion is uncertain.

A forthcoming work (Wright et al., 2006, in prep) will comb the archive of velocities in Table 1 for companions, such as HD 13345 c and HD 68988 c, of uncertain mass and orbital period.

υ And — The precision of the Lick data prior to 1995 is not as high as today – that pre-1995 data scatter about the fit with an r. m. s. ~ 100 m s^{-1}– and data before 1992 are particularly suspicious. The orbital elements in the Table 3 represent a fit with data taken before 1992 excluded; Table 1 includes these pre-1992 data.

HD 73526 b, c — These planets are in a 2:1 orbital resonance. The dynamics of the system are discussed in Tinney et al. (2006).

τ Boo b — The residuals to the fit of the 3.31 d planet orbiting τ Boo show a trend of 15 m s^{-1}y^{-1} and may also show some curvature. The precision of the Lick data prior to 1995 is not as high as it is today – the fit for these times shows scatter of ~ 100 m s^{-1}– and may not be reliable for constraining the properties of the second companion.

HD 149026 b — This planet transits its parent star. Sato et al. (2005) find $R = 0.726 \pm 0.064 \mathrm{R_{Jup}}$, and $i = 85.^\circ8^{+1.^\circ6}_{-1.^\circ3}$. The semi-amplitude, K, and goodness-of-fit parameters in Table 3 represent the fit from data presented here, with P and T_t held fixed at the values from Charbonneau et al. (2006).

TrES-1 — This planet transits its parent star, 2MASS 19040985+3637574 (GSC 02652-01324). Alonso et al. (2004) find $R = 1.08^{+0.18}_{-0.04}\mathrm{R_{Jup}}$, and $i = 88\overset{\circ}{.}5^{+1\overset{\circ}{.}5}_{-2\overset{\circ}{.}2}$. The semi-amplitude, K, and goodness-of-fit parameters in Table 3 represent the fit from data presented here, with P and T_t held fixed at the values from Alonso et al. (2004).

HD 189733 b — This planet transits its parent star. Bouchy et al. (2005b) find $i = 85\overset{\circ}{.}3 \pm 0.1$ and $R = 1.26 \pm 0.03\mathrm{R_{Jup}}$.

HD 209458 b — This planet transits its parent star. Brown et al. (2001) find $i = 86\overset{\circ}{.}1 \pm 0\overset{\circ}{.}1$ and $R = 1.347 \pm 0.06\mathrm{R_{Jup}}$ and Laughlin et al. (2005) find an eccentricity consistent with 0. The semi-amplitude, K, and goodness-of-fit parameters in Table 3 represent the fit from data presented here, with P and T_t held fixed at the values from Wittenmyer et al. (2004).

9. Distribution of Exoplanets

Fig. 6-11 show the distribution of the exoplanets in this catalog. One must take care when interpreting these figures for at least two reasons: firstly, selection effects make some aspects of these distributions inconsistent with the parent population of exoplanets, and secondly, the selection effects of the various planet search programs are different. Butler et al. (2005) and Marcy et al. (2005a) analyze the properties and distribution of planets detected around 1330 FGKM dwarfs monitored at Lick, Keck, and the AAT, and discuss the biases in and uniformity of that sample. The figures presented here are best interpreted as describing the distribution of properties of the known exoplanets as drawn from multiple, nonuniform samples, as opposed to that of the parent population of exoplanets.

The target list for the California, Carnegie, and Anglo-Australian Planet Searches has been published in Wright et al. (2004), Nidever et al. (2002), and Jones et al. (2002). A complete target list for the Geneva group is not public and not recoverable, though a list of HARPS target stars is presently available on the ESO website[2]. Both searches may be considered roughly magnitude limited within a set of $B-V$ bins excluding giant stars, but both groups have also added additional stars using other criteria (such as metallicity).

Fig. 6 shows the minimum mass distribution of the 167 known nearby exoplanets with $M \sin i < 15$ AU. The mass distribution shows a dramatic decrease in the number of planets at high masses, a decrease that is roughly characterized by a power law, $dN/dM \propto M^{-1.1}$,

[2]http://www.eso.org/observing/proposals/gto/harps/

affected very little by the unknown $\sin i$ (Jorissen, Mayor, & Udry 2001). We have calculated the exponent in this power law with a linear least-squares fit to the logarithm of the mass distribution assuming Poisson errors. We neglected uncertainties in the masses of the planets due to uncertainties in stellar masses and the $\sin i$ ambiguity. For this reason, and because the surveys that detected these planets have heterogeneous selection effects, we regard this power law simply as a rough description of the distribution of known planets. Cumming et al. (2006) finds, for the more uniform sample of the California and Carnegie Planet Search, that the distribution of planets with $P > 100$ days is well-fitted with a broken power law:

$$dN/dM \propto \begin{cases} M^{-1.2} & M < 0.6\mathrm{M_{Jup}} \\ M^{-1.9} & M > 0.6\mathrm{M_{Jup}} \end{cases} \tag{3}$$

The low end of this distribution suffers from a selection effect common to all Doppler surveys: low-mass planets induce small velocity variations, so are difficult to detect and under-represented in Fig. 6. Massive planets are easier to detect, making the apparent paucity of planets with $M > 3\mathrm{M_{Jup}}$, and that of objects with $M > 12\mathrm{M_{Jup}}$ (the "brown dwarf desert") real.

Fig. 7 shows the orbital distance distribution of the 167 known nearby exoplanets with $0.03 < a < 10$. Since orbital distance is a function of orbital period, the existing Doppler surveys are increasingly incomplete for $a \gtrsim 3$ AU, corresponding to $P \gtrsim 5$ years. Note that the abscissa is logarithmic. Among the 1330 FGKM dwarfs studied by Marcy et al. (2005a), the occurrence rate of planets within 0.1 AU is 1.2%. A modest (flat) extrapolation beyond 3 AU (in logarithmic bins) suggests that there exist roughly as many planets at distances between between 3-30 AU as below 3 AU, making the occurrence of giant planets roughly 12% within 30 AU. The rapid rise of planet frequency with semi-major axis beyond 0.5 AU portends a large population of Jupiter-like planets beyond 3 AU.

Fig. 8 shows the distribution of periods among the known nearby "hot Jupiters". There is a clear "pile-up" of planets with orbital periods near 3 days, suggesting that whatever orbital migration mechanism brings these giant planets close to their parent stars ceases when they reach this period. Alternatively, some breaking meachanism stops them there, or weakens inward of the distance, sending the planets into the star. Note that the Doppler surveys generally have uniform sensitivity to hot Jupiters at all of the orbital periods in Fig. 8, so for massive planets there is no important selection effect contributing to the 3-day pile-up.

Fig. 9 shows minimum mass as a function of semimajor axis for the 164 known nearby exoplanets with $0.03 < a < 6.5$ AU. There is a dearth of close-in exoplanets with high mass which cannot be due to a selection effect since high-mass planets have large Doppler signatures – indeed Doppler surveys are generally complete with respect to high-mass, close-in exoplanets. Selection effects make detection of low-mass planets beyond 1 AU difficult, however, so it is not clear that the mass distribution for planets beyond 1 AU is different from that of hot Jupiters.

Fig. 10 shows orbital eccentricity as a function of semimajor axis for 168 known nearby exoplanets. Planets within 0.1 AU are nearly always on circular or nearly circular orbits, presumably due to tidal circularization. Beyond 0.3 AU, the distribution of eccentricities appears essentially uniform between 0 and 0.8. For most Doppler surveys, sensitivity is not a strong function of eccentricity for $0 < e < 0.7$ and $a < 3$ AU.

Fig. 11 shows orbital eccentricity as a function of minimum mass for nearby exoplanets with $M \sin i < 13 \mathrm{M_{Jup}}$. We have excluded those planets which may have been tidally circularized, i.e. those for which $a < 0.1$ AU. This figure shows no strong correlation between eccentricity and mass, but close inspection shows that high-mass exoplanets ($M \sin i > 5 \mathrm{M_{Jup}}$) have a higher median eccentricity than lower-mass exoplanets. The completeness of Doppler surveys increases with $M \sin i$ and is generally insensitive to eccentricity for $e < 0.7$.

10. Conclusions

We have remeasured precise orbital elements for planets orbiting stars for which we have precision radial velocity data from Keck, Lick, and AAO using the latest data and improved data reduction techniques. In addition, we have compiled the published orbital parameters of all other exoplanets within 200 pc, as well as spectroscopically-derived stellar parameters of their host stars. Finally, we present four new extrasolar planets, bringing to 172 the total of known exoplanets in this catalog with a minimum mass $M \sin i < 24 \mathrm{M_{Jup}}$.

The 172 known exoplanets span a range of eccentricities, which weakly correlate with minimum planetary mass. Planets within 0.1 AU are nearly always in circular orbits, presumably due to tidal circularization. The 3-day "pile-up" and the "brown dwarf desert" are both strongly apparent and unaffected by the important observational biases. Finally, the mass distribution increases sharply toward lower masses (roughly as the inverse of the minimum planetary mass) and toward higher orbital distance. Since these regions are where current surveys are most incomplete, this implies that many more low-mass planets and long-period await discovery as Doppler surveys cover a longer time baseline and become more precise. A forthcoming work will discuss some more speculative exoplanet candidates of this nature just emereging in from our planet searches.

Fig. 6.— Minimum mass distribution of the 167 known nearby exoplanets with $M \sin i < 15$ AU. The mass distribution shows a dramatic decrease in the number of planets at high masses, a decrease that is roughly characterized by a power law, $dN/dM \propto M^{-1.16}$. Lower-mass planets have smaller Doppler amplitudes, so the relevent selection effects enhance this effect. This distribution represents results from many surveys, and so is drawn from an inhomogeneous sample.

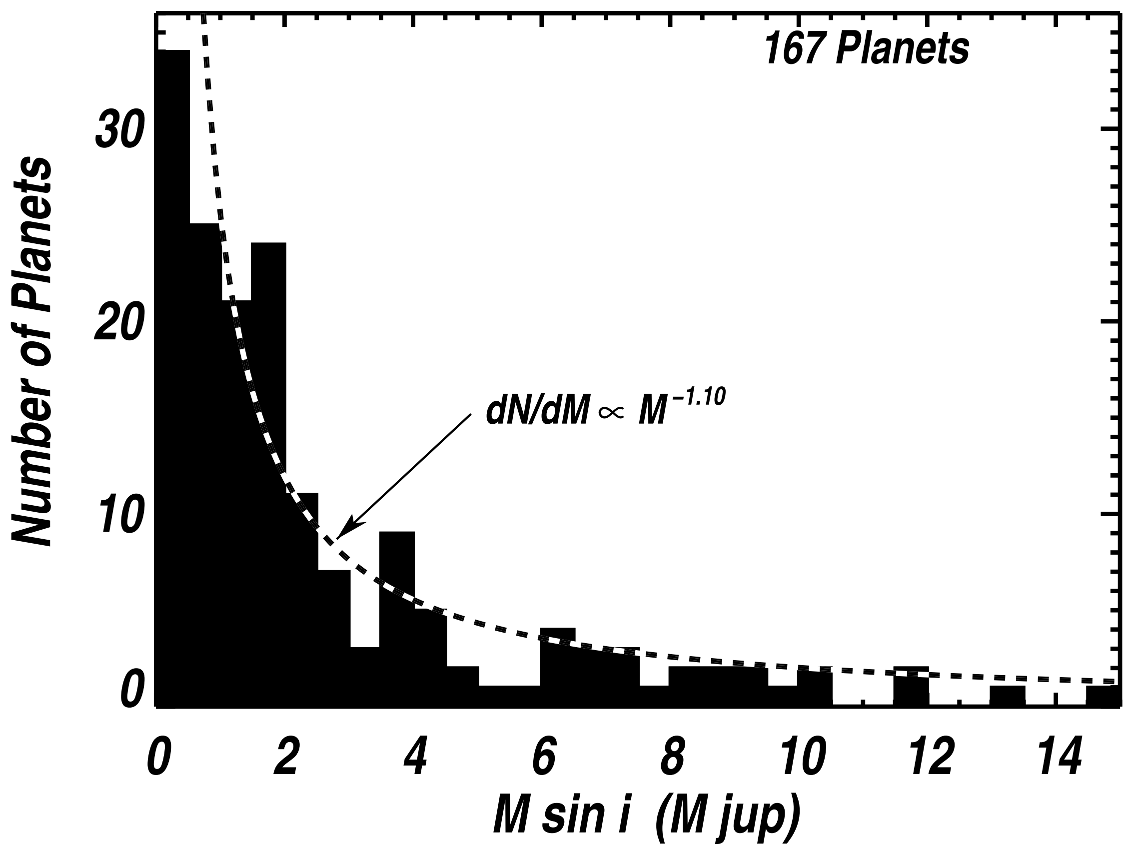

Fig. 7.— Orbital distance distribution of the 167 known nearby exoplanets with $0.03 < a < 10$ in *logarithmic* distance bins. Planets with $a > 3AU$ have periods comparable to or longer than the length of most Doppler surveys, so the distribution is incomplete beyond that distance. This distribution represents results from many surveys, and so is drawn from an inhomogeneous sample.

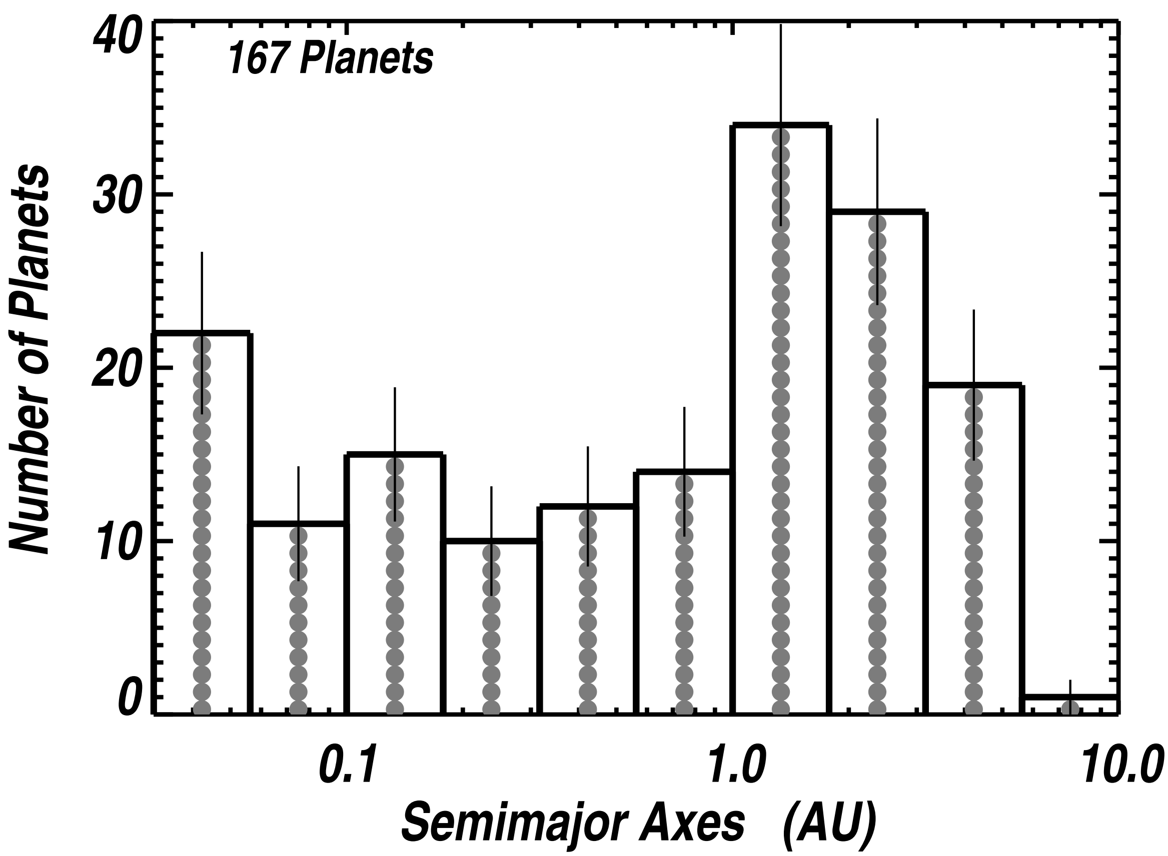

Fig. 8.— Distribution of periods among the known nearby "hot Jupiters". There is a clear "pile-up" of planets with orbital periods near 3 days. Doppler surveys generally have uniform sensitivity to hot Jupiters, so for massive planets, there is no important selection effect contributing to the 3-day pile-up. This distribution represents results from many surveys, and so is drawn from an inhomogeneous sample.

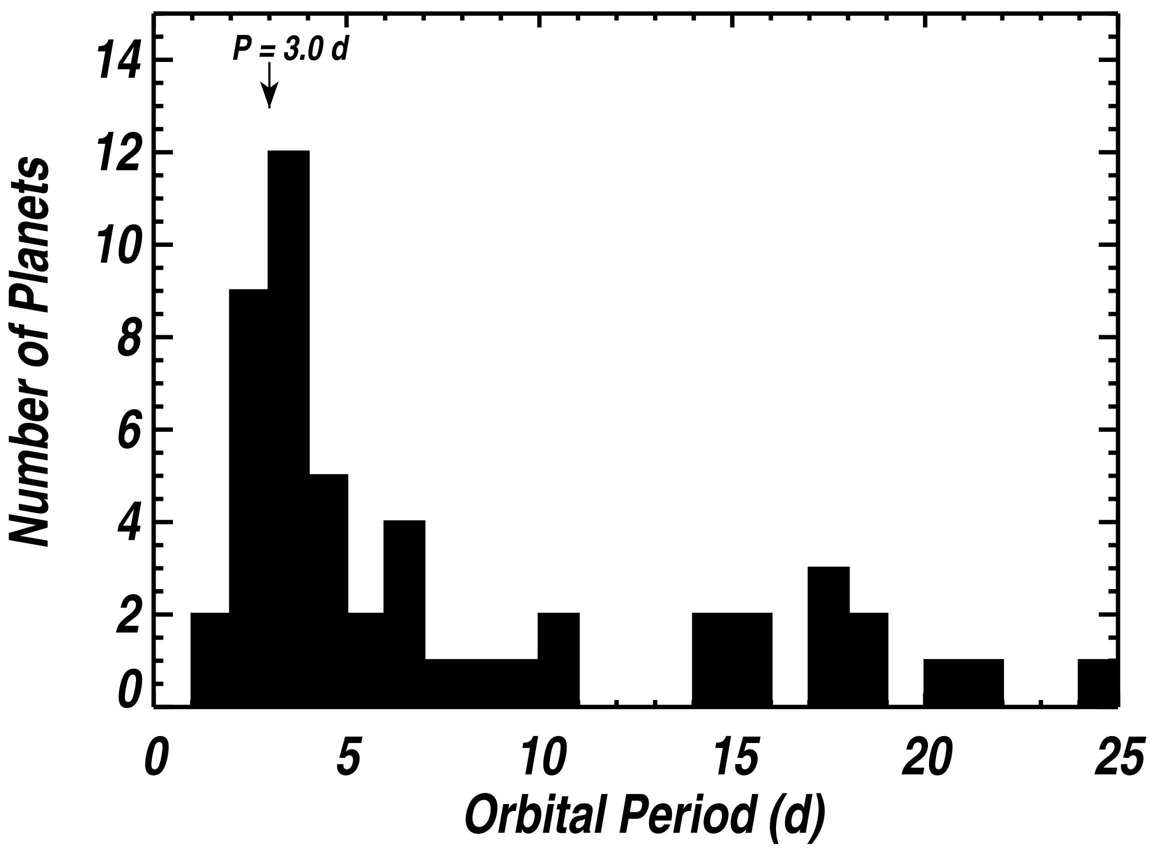

Fig. 9.— Minimum mass as a function of semimajor axis for the 164 known nearby exoplanets with $0.03 < a < 6.5$ AU. Doppler surveys are generally incomplete for exoplanets with $a > 3$ AU, low-mass planets ($M \sin i < 1\mathrm{M_{Jup}}$) beyond 1 AU, and very low-mass planets ($M \sin i < 0.1\mathrm{M_{Jup}}$) everywhere. This plot represents results from many surveys, and so is drawn from an inhomogeneous sample.

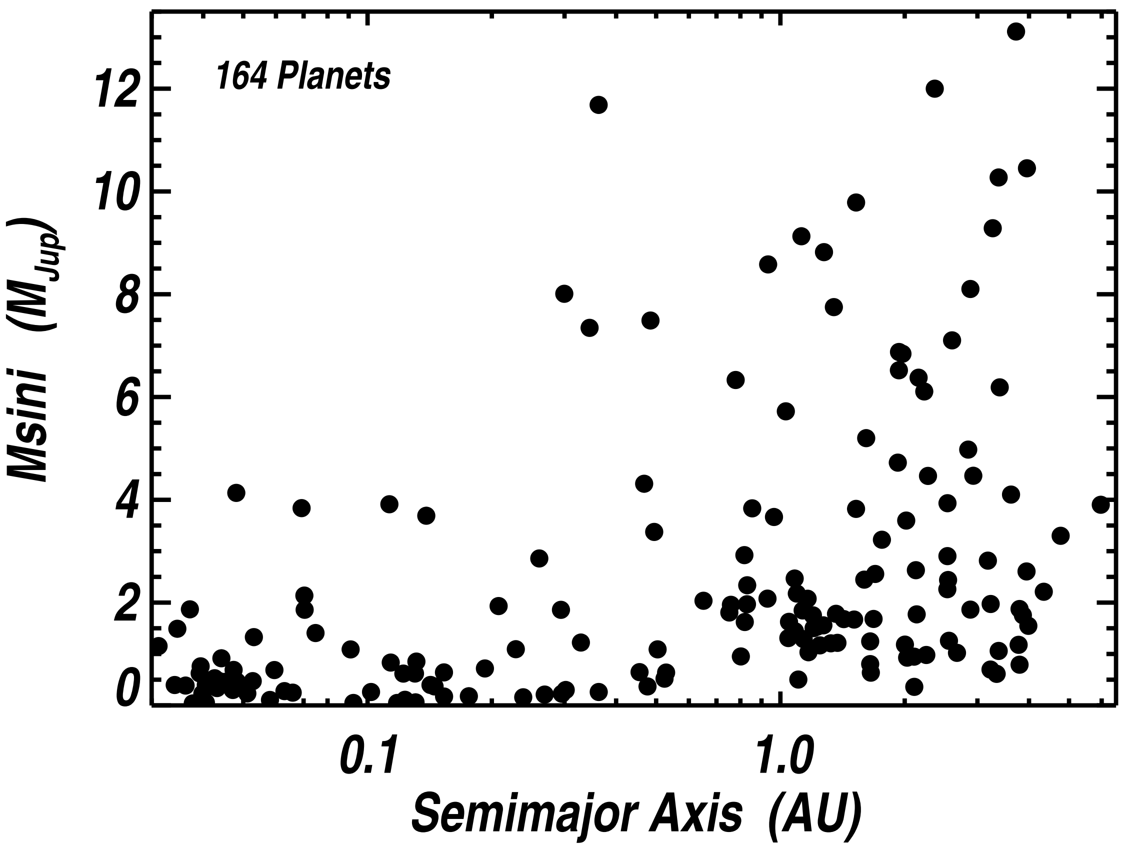

Fig. 10.— Orbital eccentricity as a function of semimajor axis for the 168 known nearby exoplanets. Planets within 0.1 AU are presumably tidally circularized. Beyond 0.1 AU, the distribution of eccentricities appears essentially uniform between 0 and 0.8. For most Doppler surveys, sensitivity is not a strong function of eccentricity for $0 < e < 0.8$ and $a < 3$ AU. This plot represents results from many surveys, and so is drawn from an inhomogeneous sample.

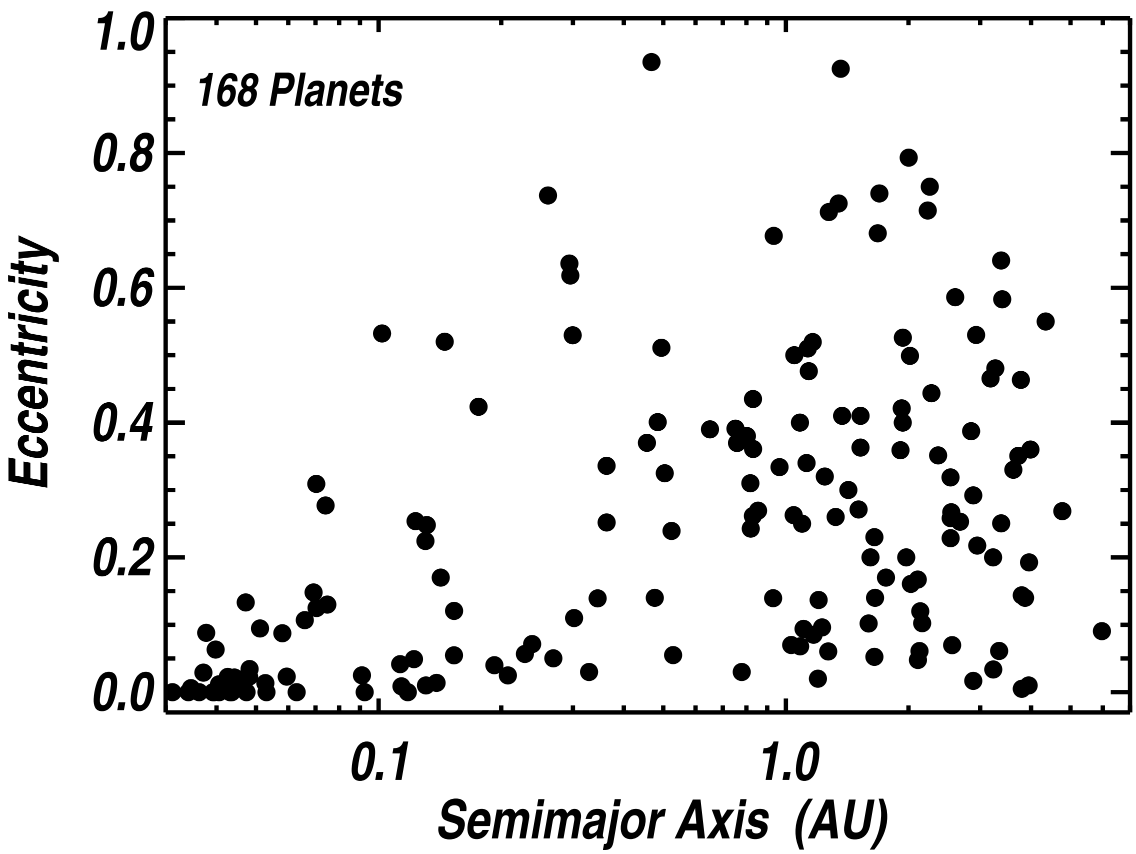

Fig. 11.— Distribution of orbital eccentricities as a function of minimum mass for the 130 known nearby exoplanets with $M \sin i < 13\mathrm{M}_{\mathrm{Jup}}$, excluding those for which $a < 0.1$ AU, i.e., those planets which may have been tidally circularized. High-mass exoplanets ($M \sin i > 5\mathrm{M}_{\mathrm{Jup}}$) have a slightly higher median eccentricity than lower-mass exoplanets. The completeness of Doppler surveys increases with $M \sin i$ and is generally insensitive to eccentricity. This distribution represents results from many surveys, and so is drawn from an inhomogeneous sample.

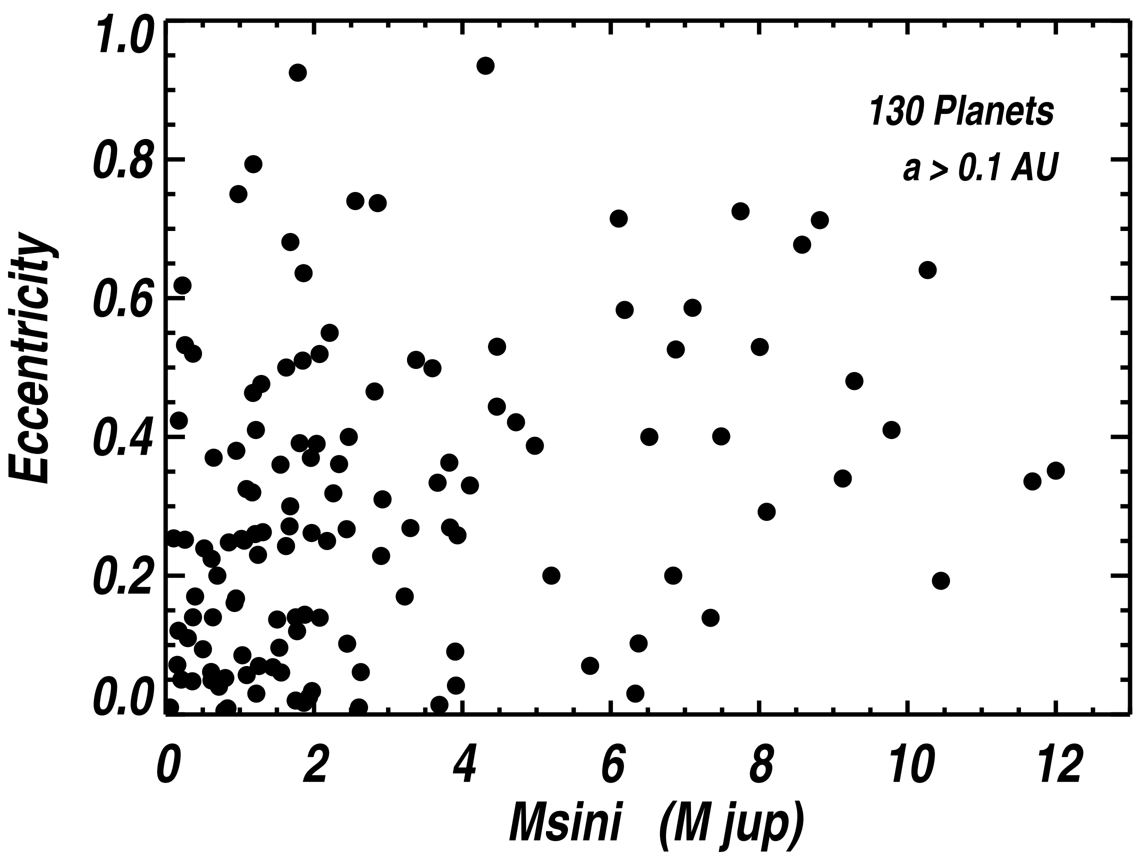

Table 2. Properties of Exoplanet Host Stars

HD	Hip #	Alt. name	RA (J2000)	Dec. (J2000)	$B-V$	V	Distance (pc)	$T_{\rm eff}$ (K)	$\log g$ (cm s^{-2})	[Fe/H]	$v \sin i$ kms^{-1}	Mass ($M_{\odot}$)	ref.[a]	S	ΔM_V	jitter (m s^{-1})
142	522		00 06 19.176	-49 04 30.69	0.52	5.70	25.64(42)	6249	4.185	0.100	10.35	1.24	VF5	0.16	0.28	4.3
1237	1292	GJ 3021	00 16 12.677	-79 51 04.25	0.75	6.59	17.62(16)	5536	4.56	0.120	···	0.90	Sn4	···	0.03	···
2039	1931		00 24 20.278	-56 39 00.17	0.66	9.00	89.8(9.1)	5941	4.384	0.315	3.25	1.17	VF5	0.18	0.60	3.7
2638	2350		00 29 59.872	-05 45 50.41	0.89	9.44	53.7(3.9)	5192	4.29	0.160	···	0.93	Sn5	···	0.31	···
3651	3093	54 Psc	00 39 21.806	+21 15 01.70	0.85	5.88	11.107(89)	5221	4.453	0.164	1.15	0.89	VF5	0.17	0.28	3.5
4208	3479		00 44 26.650	-26 30 56.45	0.66	7.78	32.7(1.2)	5600	4.517	-0.284	···	0.87	VF5	0.17	-0.33	3.7
4308	3497		00 44 39.268	-65 38 58.28	0.65	6.55	21.85(27)	5695	4.580	-0.310	···	0.90	VF5	···	-0.03	···
4203	3502		00 44 41.202	+20 26 56.14	0.77	8.70	77.8(7.7)	5702	4.361	0.453	1.23	1.13	VF5	0.14	1.27	4.0
6434	5054		01 04 40.151	-39 29 17.58	0.61	7.72	40.3(1.4)	5835	4.60	-0.520	···	0.79	Sn4	···	-0.14	···
8574	6643		01 25 12.517	+28 34 00.10	0.58	7.12	44.2(1.6)	6050	4.205	-0.009	4.52	1.15	VF5	0.14	0.43	4.1
9826	7513	υ And	01 36 47.843	+41 24 19.65	0.54	4.10	13.47(13)	6213	4.253	0.153	9.62	1.32	VF5	0.15	0.59	4.2
10647	7978		01 42 29.316	-53 44 27.00	0.55	5.52	17.35(19)	6105	4.345	-0.078	5.61	1.10	VF5	0.20	-0.18	4.2
10697	8159	109 Psc	01 44 55.825	+20 04 59.34	0.72	6.27	32.56(86)	5680	4.123	0.194	2.48	1.16	VF5	0.15	1.51	4.0
11977	8928		01 54 56.131	-67 38 50.29	0.93	4.70	66.5(2.1)	4970(70)	2.90(20)	-0.21(10)	2.4(1.0)	1.91	Sw5	···	5.73	···
11964	9094		01 57 09.606	-10 14 32.74	0.82	6.42	34.0(1.1)	5349	4.026	0.122	2.74	1.12	VF5	0.14	2.00	5.7
12661	9683		02 04 34.288	+25 24 51.50	0.71	7.43	37.2(1.1)	5743	4.423	0.362	1.30	1.11	VF5	··· [d]	0.58	3.5
13445	10138	GJ 86	02 10 25.934	-50 49 25.41	0.81	6.12	10.913(73)	5151	4.594	-0.268	2.37	0.77	VF5	0.25	-0.20	3.5
16141	12048	79 Cet	02 35 19.928	-03 33 38.17	0.67	6.83	35.9(1.8)	5794	4.217	0.170	1.93	1.12	VF5	0.14	0.86	3.6
17051	12653	ι Hor	02 42 33.466	-50 48 01.06	0.56	5.40	17.24(16)	6097	4.342	0.111	6.47	1.17	VF5	0.22	0.00	13
···	14810		03 11 14.230	+21 05 50.49	0.78	8.52	52.9(4.1)	5485(44)	4.300(70)	0.231(30)	0.50(50)	0.99	Wr6	···	0.64	···
19994	14954	94 Cet	03 12 46.437	-01 11 45.96	0.57	5.07	22.38(38)	6188	4.242	0.186	8.57	1.35	VF5	···	0.99	···
20367	15323		03 17 40.046	+31 07 37.37	0.57	6.40	27.13(79)	6138	4.53	0.170	···	1.17	Sn4	···	0.07	···
20782	15527		03 20 03.577	-28 51 14.66	0.63	7.36	36.0(1.1)	5758	4.349	-0.051	2.36	0.98	VF5	···	0.09	···
22049	16537	ϵ Eri	03 32 55.844	-09 27 29.74	0.88	3.72	3.2180(88)	5146	4.574	-0.031	2.45	0.82	VF5	0.45	-0.10	9.5
23079	17096		03 39 43.095	-52 54 57.02	0.58	7.12	34.60(67)	5927	4.337	-0.150	2.99	1.01	VF5	0.16	-0.06	4.0
23596	17747		03 48 00.374	+40 31 50.29	0.63	7.25	52.0(2.3)	5904	3.970	0.218	4.22	1.23	VF5	···	1.02	···
27442	19921	ϵ Ret	04 16 29.029	-59 18 07.76	1.08	4.44	18.23(17)	4846	3.783	0.420	2.80	1.49	VF5	0.15	3.76	5.7
27894	20277		04 20 47.047	-59 24 39.01	1.00	9.36	42.4(1.6)	4875	4.22	0.300	···	0.75	Sn5	···	0.38	···
28185	20723		04 26 26.320	-10 33 02.95	0.75	7.80	39.6(1.7)	5656	4.45	0.220	···	0.99	Sn4	···	0.58	···
30177	21850		04 41 54.373	-58 01 14.73	0.77	8.41	54.7(2.3)	5607	4.311	0.394	2.96	1.07	VF5	0.15	0.80	3.5
33283	23889		05 08 01.012	-26 47 50.90	0.64	8.05	86.9(6.8)	5995(44)	4.210(70)	0.366(30)	3.20(50)	1.24	Jh6	···	1.38	···
33636	24205		05 11 46.449	+04 24 12.74	0.59	7.00	28.7(1.1)	5904	4.429	-0.126	3.08	1.02	VF5	0.18	-0.32	5.2
33564	25110		05 22 33.532	+79 13 52.13	0.51	5.08	20.98(23)	6250	···	-0.12	···	1.25	Nd4	···	0.38	···
37124	26381		05 37 02.486	+20 43 50.84	0.67	7.68	33.2(1.3)	5500	4.599	-0.442	1.22	0.83	VF5	···	-0.17	···
39091	26394	π Men	05 37 09.892	-80 28 08.84	0.60	5.65	18.21(15)	5950	4.363	0.048	3.14	1.10	VF5	0.16	0.12	3.9
37605	26664		05 40 01.730	+06 03 38.08	0.83	8.67	42.9(2.4)	5391	4.37	0.310	···	0.80	Sn5	···	0.30	···
38529	27253		05 46 34.912	+01 10 05.50	0.77	5.95	42.4(1.7)	5697	4.049	0.445	3.90	1.47	VF5	0.17	2.71	5.7
41004 A	28393		05 59 49.649	-48 14 22.89	0.89	8.65	43.0(1.9)	5242	4.35	0.160	···	0.70	Sn5	···	0.63	···
41004 B	28393		05 59 49.649	-48 14 22.89	1.52	12.33	43.0(1.9)	3952[c]	···	···	···	0.40	Z3	···	1.22	···
40979	28767		06 04 29.943	+44 15 37.60	0.57	6.74	33.33(91)	6089	4.302	0.168	7.43	1.19	VF5	0.23	0.17	15
45350	30860		06 28 45.710	+38 57 46.67	0.74	7.89	48.9(2.3)	5616	4.325	0.291	1.37	1.06	VF5	0.15	0.90	3.5
46375	31246		06 33 12.624	+05 27 46.53	0.86	7.91	33.4(1.2)	5285	4.533	0.240	0.86	0.92	VF5	0.19	0.69	3.5
47536	31688		06 37 47.619	-32 20 23.05	1.18	5.25	121.4(8.2)	4380(50)	···	···	1.93(50)	1.1, 3.0 [b]	Sw3	···	7.46	···
49674	32916		06 51 30.516	+40 52 03.92	0.73	8.10	40.7(1.9)	5662	4.560	0.310	0.42	1.06	VF5	0.21	0.22	6.6
50499	32970		06 52 02.024	-33 54 56.02	0.61	7.21	47.3(1.5)	6070	4.373	0.335	4.21	1.25	VF5	···	0.72	···

Table 2—Continued

HD	Hip #	Alt. name	RA (J2000)	Dec. (J2000)	$B-V$	V	Distance (pc)	$T_{\rm eff}$ (K)	$\log g$ (cm s^{-2})	[Fe/H]	$v\sin i$ kms^{-1}	Mass ($M_\odot$)	ref.[a]	S	ΔM_V	jitter (m s^{-1})
50554	33212		06 54 42.825	+24 14 44.01	0.58	6.84	31.03(97)	5929	4.285	-0.066	3.88	1.05	VF5	0.16	-0.03	4.0
52265	33719		07 00 18.036	-05 22 01.78	0.57	6.29	28.07(66)	6076	4.263	0.193	4.67	1.20	VF5	0.15	0.24	4.1
63454	37284		07 39 21.851	-78 16 44.30	1.01	9.37	35.8(1.1)	4841	4.23	0.110	···	0.80	Sn5	···	0.02	···
65216	38558		07 53 41.322	-63 38 50.36	0.67	7.97	35.59(87)	5666	4.53	-0.120	···	0.92	Sn4	···	-0.28	···
66428	39417		08 03 28.665	-01 09 45.75	0.71	8.25	55.0(3.8)	5752	4.490	0.310	···	1.10	VF5	0.15	0.64	5.7
68988	40687		08 18 22.173	+61 27 38.60	0.65	8.20	58.8(3.3)	5960	4.413	0.324	2.84	1.18	VF5	0.15	0.45	3.7
70642	40952		08 21 28.136	-39 42 19.47	0.69	7.17	28.76(50)	5706	4.432	0.164	0.30	1.05	VF5	··· [d]	0.18	3.5
72659	42030		08 34 03.190	-01 34 05.58	0.61	7.46	51.4(2.7)	5920	4.236	-0.004	2.21	1.10	VF5	0.15	0.64	3.9
73256	42214		08 36 23.015	-30 02 15.46	0.78	8.08	36.5(1.0)	5636	4.30	0.260	···	1.05	Sn4	···	0.31	···
73526	42282		08 37 16.484	-41 19 08.77	0.74	8.99	94.6(9.0)	5584	4.159	0.250	2.62	1.05	VF5	···	1.21	···
74156	42723		08 42 25.122	+04 34 41.15	0.58	7.61	64.6(4.6)	6068	4.259	0.131	4.32	1.21	VF5	···	0.81	···
75289	43177		08 47 40.389	-41 44 12.45	0.58	6.35	28.94(47)	6095	4.335	0.217	4.14	1.21	VF5	0.15	0.28	4.0
75732	43587	55 Cnc, ρ^1 Cnc	08 52 35.811	+28 19 50.95	0.87	5.96	12.53(13)	5235	4.448	0.315	2.46	0.91	VF5	···	0.55	···
76700	43686		08 53 55.515	-66 48 03.57	0.75	8.16	59.7(2.4)	5668	4.299	0.345	1.35	1.13	VF5	··· [d]	1.09	3.5
80606	45982		09 22 37.568	+50 36 13.40	0.76	9.06	58(20)	5573	4.439	0.343	1.80	1.10	VF5	0.15	0.25	3.5
81040	46076		09 23 47.087	+20 21 52.03	0.68	7.72	32.6(1.3)	5700(50)	4.50(10)	-0.160(60)	2.0(1.0)	0.96	Sz6	···	-0.18	···
82943	47007		09 34 50.736	-12 07 46.37	0.62	6.54	27.46(63)	5997	4.421	0.265	1.35	1.18	VF5	···	0.27	···
83443	47202		09 37 11.828	-43 16 19.94	0.81	8.23	43.5(1.7)	5453	4.491	0.357	1.28	1.00	VF5	0.22	0.69	5.2
86081	48711		09 56 05.918	-03 48 30.32	0.66	8.73	91(10)	6028(44)	4.360(70)	0.257(30)	4.20(50)	1.21	Jh6	···	0.95	···
88133	49813		10 10 07.675	+18 11 12.74	0.81	8.01	74.5(6.4)	5494	4.230	0.340	2.20	1.20	Fi5	0.13	2.07	5.7
89307	50473		10 18 21.288	+12 37 15.99	0.59	7.02	30.88(94)	5898	4.341	-0.159	2.88	1.00	VF5	0.16	-0.14	4.0
89744	50786		10 22 10.562	+41 13 46.31	0.53	5.73	39.0(1.1)	6291	4.072	0.265	9.51	1.64	VF5	0.16	1.24	4.0
92788	52409		10 42 48.529	-02 11 01.52	0.69	7.31	32.3(1.0)	5836	4.658	0.318	0.26	1.13	VF5	0.15	0.30	3.5
93083	52521		10 44 20.915	-33 34 37.28	0.94	8.30	28.90(84)	4995	4.26	0.150	···	0.70	Sn5	···	0.37	···
···	···	BD -10°3166	10 58 28.780	-10 46 13.39	0.90	10.08	80(10)[e]	5393	4.685	0.382	0.92	1.01	VF5	0.22	··· [f]	5.7
95128	53721	47 UMa	10 59 27.974	+40 25 48.92	0.62	5.03	14.08(13)	5882	4.377	0.043	2.80	1.08	VF5	···	0.34	···
99109	55664		11 24 17.358	-01 31 44.67	0.87	9.10	60.5(4.8)	5272	4.438	0.315	1.86	0.93	VF5	0.16	0.85	5.7
99492	55848	83 Leo B	11 26 46.277	+03 00 22.78	1.00	7.58	18.0(1.1)	4955	4.770	0.362	1.36	0.86	VF5	0.25	0.30	3.5
···	57087	GJ 436	11 42 11.094	+26 42 23.65	1.49	10.67	10.23(24)	4002[c]	···	···	···	0.41	Bu4	0.73	-0.66	3.9
101930	57172		11 43 30.111	-58 00 24.79	0.91	8.21	30.50(89)	5079	4.24	0.170	···	0.74	Sn5	···	0.42	···
102117	57291		11 44 50.462	-58 42 13.35	0.72	7.47	42.0(1.5)	5695	4.366	0.295	0.88	1.11	VF5	··· [d]	0.87	3.5
102195	57370		11 45 42.292	+02 49 14.34	0.83	8.07	28.98(97)	5200[c]	···	-0.090(14)	···	0.93	Ge5	···	0.09	···
104985	58952		12 05 15.118	+76 54 20.64	1.03	5.78	102.0(5.4)	4794[c]	···	···	···	1.60	St3	···	5.97	···
106252	59610		12 13 29.509	+10 02 29.90	0.63	7.41	37.4(1.3)	5870	4.364	-0.076	1.93	1.02	VF5	0.16	0.15	3.8
107148	60081		12 19 13.491	-03 19 11.24	0.71	8.01	51.3(2.6)	5797	4.446	0.314	0.73	1.12	VF5	0.16	0.68	3.5
108147	60644		12 25 46.269	-64 01 19.52	0.54	6.99	38.6(1.0)	6156	4.292	0.087	6.10	1.19	VF5	0.19	0.00	8.1
108874	61028		12 30 26.883	+22 52 47.38	0.74	8.76	68.5(5.8)	5551	4.349	0.182	2.22	1.00	VF5	···	0.75	···
109749	61595		12 37 16.378	-40 48 43.62	0.68	8.08	59.0(6.7)	5903(50)	4.403(70)	0.250(50)	2.50(50)	1.21	Fi6	···	0.75	···
111232	62534		12 48 51.754	-68 25 30.54	0.70	7.59	28.88(67)	5494	4.50	-0.360	···	0.78	Sn4	···	-0.18	···
114386	64295		13 10 39.823	-35 03 17.22	0.98	8.73	28.0(1.0)	4820	4.707	0.004	0.59	0.76	VF5	···	0.03	···
114762	64426		13 12 19.743	+17 31 01.64	0.52	7.30	40.6(2.4)	5953	4.545	-0.653	1.77	0.89	VF5	··· [d]	-0.28	4.3
114783	64457		13 12 43.786	-02 15 54.14	0.93	7.56	20.43(44)	5135	4.527	0.116	0.87	0.86	VF5	0.21	0.29	3.5
114729	64459		13 12 44.257	-31 52 24.06	0.59	6.68	35.0(1.2)	5821	4.143	-0.262	2.29	1.00	VF5	0.15	0.45	4.0
117176	65721	70 Vir	13 28 25.809	+13 46 43.63	0.71	4.97	18.11(24)	5545	4.068	-0.012	2.68	1.11	VF5	0.17	1.50	4.0
117207	65808		13 29 21.114	-35 34 15.59	0.72	7.26	33.0(1.0)	5724	4.507	0.266	1.05	1.08	VF5	0.15	0.58	3.5

Table 2—Continued

HD	Hip #	Alt. name	RA (J2000)	Dec. (J2000)	$B-V$	V	Distance (pc)	$T_{\rm eff}$ (K)	$\log g$ (cm s^{-2})	[Fe/H]	$v \sin i$ kms^{-1}	Mass (M$_{\odot}$)	ref.[a]	S	$\Delta M_{\rm V}$	jitter (m s^{-1})
117618	66047		13 32 25.556	-47 16 16.91	0.60	7.17	38.0(1.3)	5964	4.350	0.003	3.19	1.09	VF5	0.17	0.22	5.3
118203	66192		13 34 02.537	+53 43 42.70	0.70	8.05	88.6(6.4)	5600(150)	3.87	0.100(50)	4.70	1.23	Da6	···	1.78	···
120136	67275	τ Boo	13 47 15.743	+17 27 24.86	0.51	4.50	15.60(17)	6387	4.256	0.234	14.98	1.35	VF5	0.20	0.33	15
121504	68162		13 57 17.237	-56 02 24.15	0.59	7.54	44.4(1.8)	6075	4.64	0.160	···	1.18	Sn4	···	0.12	···
128311	71395		14 36 00.561	+09 44 47.47	0.97	7.48	16.57(27)	4965	4.831	0.205	3.65	0.84	VF5	···	0.10	···
130322	72339		14 47 32.727	-00 16 53.31	0.78	8.04	29.8(1.3)	5308	4.408	0.006	1.61	0.88	VF5	0.23	-0.10	3.5
134987	74500	23 Lib	15 13 28.668	-25 18 33.65	0.69	6.47	25.65(64)	5750	4.348	0.279	2.17	1.10	VF5	0.15	0.62	3.5
136118	74948		15 18 55.472	-01 35 32.59	0.55	6.93	52.3(2.3)	6097	4.053	-0.050	7.33	1.23	VF5	0.16	0.82	4.2
···	74995	GJ 581	15 19 26.825	-07 43 20.21	1.60	10.57	6.269(89)	3780[c]	···	-0.25	···	0.31	Nd4	···	0.24	···
137759	75458	ι Dra	15 24 55.775	+58 57 57.84	1.17	3.29	31.33(50)	4548[c]	···	···	···	1.05	Ad9	··· [d]	6.43	5.7
137510	75535		15 25 53.270	+19 28 50.54	0.62	6.26	41.8(1.6)	5966	3.995	0.373	7.98	1.42	VF5	0.16	1.43	4.0
330075	77517		15 49 37.691	-49 57 48.69	0.94	9.36	50.2(3.8)	5017	4.22	0.080	···	0.70	Sn5	···	0.47	···
141937	77740		15 52 17.547	-18 26 09.83	0.63	7.25	33.5(1.2)	5847	4.420	0.129	1.88	1.08	VF5	···	0.02	···
142415	78169		15 57 40.791	-60 12 00.93	0.62	7.33	34.6(1.0)	5902	4.382	0.088	3.43	1.09	VF5	···	-0.03	···
143761	78459	ρ CrB	16 01 02.662	+33 18 12.63	0.61	5.39	17.43(22)	5823	4.365	-0.199	1.56	1.00	VF5	0.15	0.37	3.9
142022	79242		16 10 15.024	-84 13 53.80	0.79	7.70	35.87(87)	5499	4.36	0.190	···	0.90	Sn5	···	0.69	···
145675	79248	14 Her	16 10 24.314	+43 49 03.52	0.88	6.61	18.15(19)	5388	4.517	0.460	1.56	1.00	VF5	0.16	0.74	3.5
147513	80337		16 24 01.290	-39 11 34.73	0.62	5.37	12.87(14)	5930	4.612	0.089	1.55	1.07	VF5	···	-0.19	···
149026	80838		16 30 29.619	+38 20 50.31	0.61	8.15	78.9(4.9)	6147(50)	···	0.360(50)	6.00(50)	1.30	St5	···	0.88	···
150706	80902		16 31 17.586	+79 47 23.19	0.61	7.01	27.23(42)	5961	4.50	-0.010	···	0.98	Sn4	···	-0.32	···
149143	81022		16 32 51.050	+02 05 05.39	0.71	7.89	63.5(4.3)	5884(50)	4.071(70)	0.260(50)	4.00(50)	1.20	Fi6	···	1.31	···
154857	84069		17 11 15.722	-56 40 50.87	0.70	7.24	68.5(4.3)	5606	3.992	-0.220	1.44	1.22	VF5	···	2.03	···
160691	86796	μ Ara	17 44 08.703	-51 50 02.59	0.69	5.12	15.28(19)	5784	4.298	0.293	3.12	1.15	VF5	···	0.86	···
162020	87330		17 50 38.357	-40 19 06.06	0.96	9.10	31.3(1.4)	4845	4.901	0.112	2.32	0.78	VF5	···	-0.18	···
164922	88348		18 02 30.862	+26 18 46.81	0.80	7.01	21.93(34)	5385	4.506	0.170	1.84	0.94	VF5	0.16	0.36	5.7
168443	89844		18 20 03.932	-09 35 44.60	0.72	6.92	37.9(1.2)	5580	4.248	0.077	2.20	1.05	VF5	··· [d]	1.22	4.0
168746	90004		18 21 49.783	-11 55 21.66	0.71	7.95	43.1(1.8)	5564	4.518	-0.078	···	0.93	VF5	0.15	0.40	3.5
169830	90485		18 27 49.484	-29 49 00.71	0.52	5.90	36.3(1.2)	6221	4.057	0.153	3.83	1.43	VF5	···	0.82	···
···	···	TrES-1	19 04 09.8	+36 57 57	0.78	11.79	150.0(6.0)	5250(75)	4.60(20)	0.000(90)	10.353(66)	0.89	Sz4	···	-0.35	···
177830	93746		19 05 20.774	+25 55 14.38	1.09	7.18	59.0(2.6)	4949	4.032	0.545	2.54	1.46	VF5	0.12	3.63	5.7
178911 B	94075		19 09 03.104	+34 35 59.45	0.75	7.97	47(11)	5668	4.554	0.285	1.94	1.06	VF5	0.17	0.77	3.8
179949	94645		19 15 33.228	-24 10 45.67	0.55	6.25	27.05(59)	6168	4.341	0.137	7.02	1.21	VF5	0.19	0.04	8.6
183263	95740		19 28 24.573	+08 21 29.00	0.68	7.86	52.8(3.0)	5936	4.403	0.302	1.56	1.17	VF5	0.14	0.72	3.6
186427	96901	16 Cyg B	19 41 51.972	+50 31 03.08	0.66	6.25	21.41(24)	5674	4.355	0.038	2.18	0.99	VF5	0.15	0.26	3.7
187123	97336		19 46 58.113	+34 25 10.29	0.66	7.83	47.9(1.6)	5815	4.359	0.121	2.15	1.08	VF5	0.15	0.43	3.7
187085	97546		19 49 33.367	-37 46 49.98	0.57	7.22	45.0(2.3)	6075	4.276	0.088	5.09	1.16	VF5	···	0.35	···
188015	97769		19 52 04.543	+28 06 01.36	0.73	8.24	52.6(2.6)	5746	4.445	0.289	···	1.09	VF5	0.15	0.63	3.5
189733	98505		20 00 43.713	+22 42 39.070	1.20	7.50	19.25(32)	5050(50)	4.53(14)	-0.030(40)	3.5(50)	0.82	Bc5	···	1.32	···
190228	98714		20 03 00.773	+28 18 24.68	0.79	7.30	62.1(3.1)	5348	3.976	-0.180	1.85	1.16	VF5	···	2.30	···
190360	98767	GJ 777 A	20 03 37.405	+29 53 48.50	0.75	5.73	15.89(16)	5552	4.385	0.213	2.20	1.01	VF5	···	0.66	···
192263	99711		20 13 59.845	-00 52 00.76	0.94	7.79	19.89(45)	4975	4.604	0.054	2.63	0.81	VF5	0.49	0.04	7.7
195019	100970		20 28 18.636	+18 46 10.19	0.66	6.87	37.4(1.2)	5788	4.225	0.068	2.47	1.07	VF5	0.15	0.86	3.7
196050	101806		20 37 51.710	-60 38 04.14	0.67	7.50	46.9(2.0)	5892	4.267	0.229	3.27	1.15	VF5	0.15	0.76	3.6
202206	104903		21 14 57.769	-20 47 21.15	0.71	8.08	46.3(2.4)	5788	4.493	0.354	2.30	1.12	VF5	···	0.43	···
208487	108375		21 57 19.848	-37 45 49.04	0.57	7.47	44.0(2.0)	6067	4.335	0.022	4.61	1.13	VF5	0.17	0.01	5.4

Table 2—Continued

HD	Hip #	Alt. name	RA (J2000)	Dec. (J2000)	$B-V$	V	Distance (pc)	$T_{\rm eff}$ (K)	$\log g$ (cm s^{-2})	[Fe/H]	$v \sin i$ kms^{-1}	Mass ($M_\odot$)	ref.[a]	S	ΔM_V	jitter (m s^{-1})
209458	108859		22 03 10.800	+18 53 04.00	0.59	7.65	47.1(2.2)	6099	4.382	0.014	4.49	1.14	VF5	···	0.15	···
210277	109378		22 09 29.866	-07 32 55.15	0.77	6.54	21.29(36)	5555	4.495	0.214	1.80	1.01	VF5	0.16	0.62	3.5
212301	110852		22 27 30.920	-77 43 04.52	0.56	7.76	52.7(2.0)	6000	···	-0.18	···	1.05	Nd4	···	0.06	···
213240	111143		22 31 00.367	-49 25 59.77	0.60	6.81	40.7(1.3)	5968	4.222	0.139	3.97	1.22	VF5	0.16	0.73	3.9
···	113020	GJ 876	22 53 16.734	-14 15 49.32	1.60	10.16	4.702(46)	3787[c]	···	···	···	0.32	Mc8	···	-0.03	···
216435	113044	τ^1 Gru	22 53 37.931	-48 35 53.83	0.62	6.03	33.29(81)	5999	4.154	0.244	5.78	1.30	VF5	0.16	1.19	4.0
216437	113137	ρ Ind	22 54 39.483	-70 04 25.35	0.66	6.04	26.52(41)	5849	4.231	0.225	3.13	1.19	VF5	0.15	0.93	3.7
216770	113238		22 55 53.710	-26 39 31.55	0.82	8.11	37.9(1.5)	5423	4.40	0.260	···	0.90	Sn4	···	0.56	···
217014	113357	51 Peg	22 57 27.980	+20 46 07.80	0.67	5.45	15.36(18)	5787	4.449	0.200	2.57	1.09	VF5	0.15	0.37	3.7
217107	113421		22 58 15.541	-02 23 43.39	0.74	6.17	19.72(29)	5704	4.541	0.389	···	1.10	VF5	···	0.66	···
222404	116727	γ Cep	23 39 20.849	+77 37 56.19	1.03	3.21	13.793(99)	4791[c]	3.33(10)	0.180(80)	1.5(1.0)	1.59	Fu4	···	4.21	···
222582	116906		23 41 51.530	-05 59 08.73	0.65	7.68	41.9(2.0)	5727	4.342	-0.029	2.29	0.99	VF5	0.16	0.21	3.7
224693	118319		23 59 53.833	-22 25 41.21	0.64	8.23	94(10)	6037(44)	4.380(70)	0.343(30)	3.50(50)	1.33	Jh6	···	1.36	···

[a]References are encoded as follows: Ad9: Allende Prieto & Lambert (1999); Bc5: Bouchy et al. (2005b); Bu4: Butler et al. (2004); Da6: da Silva et al. (2006); Fi5: Fischer et al. (2005); Fi6: Fischer et al. (2006); Wr6: J. T. Wright et al. (2006) in prep.; Fu4: Fuhrmann (2004); Ge5: Ge et al. (2005), http://vo.obspm.fr/exoplanets/encyclo/planet.php?p1=HD+102195&p2=b; Jh6: J. A. Johnson et al. 2006; Mc8: Marcy & Benitz (1989); Nd4: Nordström et al. (2004); Sn4: Santos, Israelian, & Mayor (2004); Sn5: Santos et al. (2005); St3: Sato et al. (2003); St5: Sato et al. (2005); Sw3: Setiawan et al. (2003); Sz4: Sozzetti et al. (2004); Sz6: Sozzetti et al. (2006); VF5: Valenti & Fischer (2005); Z3: Zucker et al. (2003)

[b]This giant star has a poorly determined mass; both estimates are plausible.

[c]No effective temperature available: $T_{\rm eff}$ is estimated from $B-V$ using Flower (1996).

[d]No S-value available: star is assumed to be very inactive.

[e]BD -10°3166 appears to be a metal-rich K0 dwarf. Based upon its spectroscopic similarity to 55 Cnc (Gonzalez, Wallerstein, & Saar 1999), a star 4.1 mag brighter in V band, we can crudely infer a distance $\sim$ 7 times greater than that star, or $\sim$ 80 pc.

[f]No parallax available: star is assumed to be on the main sequence.

Table 3. Catalog of Nearby Extrasolar Planets

	Planet		Per (d)	K (m s^{-1})	e	ω (deg)	$T_{\rm p}$ (JD-2440000)	$T_{\rm t}$ (JD-2440000)	trend (m s^{-1}yr^{-1})	$M \sin i$ ($M_{\rm Jup}$)	a (AU)	r.m.s. (m s^{-1})	$\sqrt{\chi^2_\nu}$	$N_{\rm obs}$	ref.[a] (alt.)
1	HD 142	b	350.3(3.6)	33.9(4.7)	0.26(18)[b]	303[b]	11963(43)	11737(25)	-10.4(1.1)	1.31(18)	1.045(61)	12	1.5	53	Bu6
2	HD 1237	b	133.71(20)	167.0(4.0)	0.511(17)	290.7(3.0)	11545.86(64)	···		3.37(49)	0.495(29)	19	1.8	61	Nf1b
3	HD 2039	b	1120(23)	153(22)	0.715(46)	344.1(3.6)	12041(13)	10992(26)	3.5(1.5)	6.11(82)	2.23(13)	11	0.84	41	Bu6
4	HD 2638	b	3.44420(20)	67.40(40)	0[c]	0[c]	13323.2060(20)	···		0.477(68)	0.0436(25)	3.3	···	28	Mo5
5	54 Psc	b	62.206(21)	16.0(1.2)	0.618(51)	233.3(7.4)	12189.83(68)	12176.3(1.9)		0.227(23)	0.296(17)	6.6	1.3	163	Bu6
6	HD 4208	b	828.0(8.1)	19.06(73)	0.052(40)[b]	345[b]	11040(120)	10440(16)		0.804(73)	1.650(96)	3.4	0.72	41	Bu6
7	HD 4308	b	15.560(20)	4.07(20)	0.000(10)	359(47)	13311.7(2.0)	···		0.0467(70)	0.1179(68)	1.3	1.4	41	Udry 2005
8	HD 4203	b	431.88(85)	60.3(2.2)	0.519(27)	329.1(3.1)	11918.9(2.7)	11558.7(7.2)	-4.38(71)	2.07(18)	1.164(67)	4.1	0.80	23	Bu6
9	HD 6434	b	21.9980(90)	34.2(1.1)	0.170(30)	156(11)	11490.80(60)	···		0.397(59)	0.1421(82)	11	···	130	My4
10	HD 8574	b	225.0(1.1)	64.1(5.5)	0.370(82)	2(16)	11475.6(5.5)	11504.8(7.3)		1.96(22)	0.759(44)	23	1.6	26	Bu6 (Pr3)
11	υ And	b	4.617113(82)	69.8(1.5)	0.023(18)[b]	63[b]	11802.64(71)	11802.966(33)		0.687(58)	0.0595(34)	13	1.4	268	Bu6 (Nf4)
12		c	241.23(30)	55.6(1.7)	0.262(21)	245.5(5.3)	10158.1(4.5)	10063.9(3.8)		1.98(17)	0.832(48)				
13		d	1290.1(8.4)	63.4(1.5)	0.258(32)	279(10)	8827(30)	8127(39)		3.95(33)	2.54(15)				
14	HD 10647	b	1003(56)	17.9(4.6)	0.16(22)[b]	336[b]	10960(160)	10221(83)		0.93(18)	2.03(15)	9.4	1.4	28	Bu6 (My3)
15	109 Psc	b	1076.4(2.4)	115.0(1.5)	0.1023(96)	108.9(8.2)	10396(29)	10350.4(5.6)		6.38(53)	2.16(12)	6.8	1.4	59	Bu6
16	HD 11977	b	711.0(8.0)	105.0(8.0)	0.400(70)	351.5(9.5)	11420.0	···		6.5(1.2)	1.94(11)	29	···		Sw5
17	HD 11964	b	2110(270)	9.0(1.5)	0.06(17)[b]	168[b]	12290(420)	11870(120)	0.67(30)	0.61(10)	3.34(40)	5.4	0.87	87	Bu6
18	HD 12661	b	262.53(27)	74.19(85)	0.361(11)	296.3(2.6)	10214.1(2.9)	10046.1(2.5)		2.34(19)	0.831(48)	7.8	1.1	108	Bu6
19		c	1679(29)	29.27(88)	0.017(29)[b]	38[b]	12130(330)	12368(22)		1.83(16)	2.86(17)				
20	HD 13445	b	15.76491(39)	376.7(2.9)	0.0416(72)	269(16)	11903.36(59)	11895.551(76)	-94.9(1.0)	3.91(32)	0.1130(65)	12	2.1	42	Bu6 (Q0)
21	79 Cet	b	75.523(55)	11.99(87)	0.252(52)	42(14)	10338.0(3.0)	10344.1(1.6)		0.260(28)	0.363(21)	3.7	0.82	71	Bu6
22	ι Hor	b	302.8(2.3)	57.1(5.2)	0.14(13)[b]	346[b]	11227(46)	10998(19)		2.08(26)	0.930(54)	19	1.3	25	Bu6 (Nf1b)
23	HIP 14810	b	6.6740(20)	420.7(3.0)	0.1480(60)	153.0(2.0)	13694.500(40)	···		3.84(54)	0.0692(40)	8.3	1.4	15	Wr6
24	94 Cet	b	535.7(3.1)	36.2(1.9)	0.300(40)	41.0(8.0)	10944(12)	···		1.69(26)	1.428(83)	8.1	···	48	My4
25	HD 20367	b	469.5(9.3)	29.0(3.0)	0.320(90)	135(16)	11860(18)	···		1.17(23)	1.246(75)	10	···	27	U3b
26	HD 20782	b	585.860(30)	115(12)	0.925(30)	147.0(3.0)	11687.1(2.5)	···		1.78(34)	1.364(79)	5.0	1.0	29	Jo6
27	ϵ Eri	b	2500(350)	18.6(2.9)	0.25(23)[b]	6[b]	8940(520)	9330(200)		1.06(16)	3.38(43)	12	1.0	120	Bu6 (H0)
28	HD 23079	b	730.6(5.7)	54.9(1.1)	0.102(31)	55(17)	10492(37)	10551(14)		2.45(21)	1.596(93)	4.8	0.69	19	Bu6
29	HD 23596	b	1565(21)	124.0(3.0)	0.292(23)	274.1(3.9)	11604(15)	···		7.8(1.1)	2.83(17)	9.2	1.1	39	Pr3
30	ϵ Ret	b	428.1(1.1)	32.2(1.4)	0.060(43)[b]	216[b]	10836(55)	10692.2(8.6)		1.56(14)	1.271(73)	6.5	1.1	55	Bu6
31	HD 27894	b	17.9910(70)	58.10(50)	0.0490(80)	132.9(9.7)	13275.46(48)	···		0.618(88)	0.1221(71)	4.0	···	20	Mo5
32	HD 28185	b	383.0(2.0)	161(11)	0.070(40)	351(25)	11863(26)	···		5.72(93)	1.031(60)	10	···	40	Sn1
33	HD 30177	b	2770(100)	146.8(2.8)	0.193(25)	34(15)	11437(72)	11738(16)		10.45(88)	3.95(26)	10	0.96	22	Bu6
34	HD 33283	b	18.1790(70)	25.2(2.0)	0.480(50)	155.8(8.0)	13017.60(30)	···	···	0.330	0.145	3.6	0.77	25	Jh6
35	HD 33636	b	2127.7(8.2)	164.2(2.0)	0.4805(60)	339.5(1.4)	11205.8(6.4)	9396(12)		9.28(77)	3.27(19)	8.9	0.98	38	Bu6 (Pr3)
36	HD 33564	b	388.0(3.0)	232.0(5.0)	0.340(20)	205.0(4.0)	12603.0(8.0)	···		9.1(1.3)	1.124(65)	6.7	···	15	Ga5
37	HD 37124	b	154.46	27.5	0.055	140.5	10000.11	···		0.64(11)	0.529(31)	18	1.9	52	Vo5 (U3b)
38		c	2295.00	12.2	0.200	266.0	9606.00	···		0.683(88)	3.19(18)				
		c[e]	29.3[e]	13.2[e]	0.160[e]	290.0[e]	9981.3[e]	···		0.170[e]	0.170[e]	5.1[e]	1.1[e]		

Table 3—Continued

	Planet		Per (d)	K (m s^{-1})	e	ω (deg)	$T_{\rm p}$ (JD-2440000)	$T_{\rm t}$ (JD-2440000)	trend (m s^{-1}yr^{-1})	$M \sin i$ (M$_{\rm Jup}$)	a (AU)	r.m.s. (m s^{-1})	$\sqrt{\chi^2_\nu}$	N$_{\rm obs}$	ref.[a] (alt.)
39		d	843.60	15.4	0.140	314.3	9409.40	···		0.624(63)	1.639(95)				
40	π Men	b	2151(85)	196.4(1.3)	0.6405(72)	330.24(67)	7820(170)	5920(260)		10.27(84)	3.38(22)	5.5	0.93	42	Bu6
41	HD 37605	b	54.23(23)	262.9(5.5)	0.737(10)	211.6(1.7)	12994.27(45)	···		2.86(41)	0.261(15)	4.7	···	27	Cc4
42	HD 38529	b	14.3093(13)	56.8(1.6)	0.248(23)	91.2(6.2)	9991.59(23)	9991.56(17)		0.852(74)	0.1313(76)	13	1.6	162	Bu6
43		c	2165(14)	170.3(1.7)	0.3506(85)	15.7(1.9)	10085(15)	10319(13)		13.2(1.1)	3.74(22)				
44	HD 41004 A	b	963(38)	99(60)	0.74(20)	97(31)	12425(37)	···		2.6(1.8)	1.70(11)	10	···	149	Z4
45	HD 41004 B	b	1.328300(12)	6114(71)	0.081(12)	178.5(7.8)	12434.880(29)	···		18.4(2.6)	0.0177(10)	600	···	149	Z4
46	HD 40979	b	263.84(71)	112.0(5.0)	0.269(34)	318(10)	10748.1(8.6)	10561.2(6.4)		3.83(36)	0.855(49)	23	1.3	65	Bu6
47	HD 45350	b	967.0(6.2)	64.2(2.5)	0.798(53)	342.4(8.6)	11822(13)	10894(16)		1.96(17)	1.96(11)	4.4	0.96	40	Bu6 (Ed6)
48	HD 46375	b	3.023573(65)	33.65(74)	0.063(26)	114(24)	11071.53(19)	11071.359(37)		0.226(19)	0.0398(23)	4.2	0.97	50	Bu6
49	HD 47536	b	712.13(31)	113(11)	0.200(80)	261(24)	11599(22)	···		5.20(99)[f]	1.613(93)[f]	26	0.97	39	Sw3
50	HD 49674	b	4.94737(98)	12.04(88)	0.087(95)[b]	264[b]	11882.38(88)	11880.00(18)		0.105(11)	0.0580(34)	4.7	0.66	39	Bu6
51	HD 50499	b	2480(110)	22.9(3.0)	0.14(20)	262(36)	11230(230)	···	-4.8	1.75(53)	3.87(26)	4.8	1.1	35	Vo5
52	HD 50554	b	1224(12)	91.5(7.6)	0.444(38)	7.4(4.3)	10646(16)	10767(18)		4.46(48)	2.28(13)	12	1.1	51	Bu6 (Pr3)
53	HD 52265	b	119.290(86)	42.1(3.1)	0.325(65)	243(15)	10833.7(4.2)	10790.1(6.7)		1.09(11)	0.504(29)	10	1.6	28	Bu6 (Nf1b)
54	HD 63454	b	2.817822(95)	64.30(70)	0[c]	0[c]	13111.1290(50)	···		0.385(55)	0.0363(21)	7.1	···	57	Mo5
55	HD 65216	b	613(11)	33.7(1.1)	0.410(60)	198.0(6.0)	10762(25)	···		1.22(19)	1.374(82)	6.8	···	70	My4
56	HD 66428	b	1973(31)[d]	48.3(2.7)[d]	0.465(30)[d]	152.9(3.9)	12139(16)	12012.1(7.1)		2.82(27)	3.18(19)	2.9	0.46	29	Bu6
57	HD 68988	b	6.27711(21)	184.7(3.7)	0.1249(87)	31.4(3.5)	11548.84(16)	11549.663(40)	-23.8(1.7)	1.86(16)	0.0704(41)	13	2.8	28	Bu6
58	HD 70642	b	2068(39)	30.4(1.3)	0.034(43)[b]	205[b]	11350(380)	10707(48)		1.97(18)	3.23(19)	4.3	0.90	28	Bu6
59	HD 72659	b	3630(230)	42.5(1.2)	0.269(38)	258(13)	11673(89)	10060(240)		3.30(29)	4.77(37)	4.2	0.83	32	Bu6
60	HD 73256	b	2.54858(16)	269.0(8.0)	0.029(20)	337(46)	12500.18(28)	···		1.87(27)	0.0371(21)	15	···	40	U3
61	HD 73526	b	187.499(30)	76.1(5.1)	0.390(54)	172(29)	10038(15)	···		2.04(29)	0.651(38)	9.2	0.95	30	T6
62		c	376.879(90)	67.4(3.6)	0.400(54)	183(13)	10184.5(8.6)	···		2.26(27)	1.037(60)				
63	HD 74156	b	51.643(11)	112.0(1.9)	0.6360(91)	181.5(1.4)	11981.321(91)	···		1.80(26)	0.290(17)	11	1.3	95	Nf4
64		c	2025(11)	104.0(5.5)	0.583(39)	242.4(4.0)	10901(10)	···		6.00(95)	3.35(19)				
65	HD 75289	b	3.509267(64)	54.9(1.8)	0.034(29)[b]	141[b]	10830.34(48)	10829.872(38)		0.467(41)	0.0482(28)	6.6	1.1	30	Bu6 (U0)
66	55 Cnc	b	14.652(10)	73.38(82)	0.01(13)	168(33)	10004.354(10)	···		0.833(69)	0.1138(66)	7.3	1.6	> 100	MA4 (Nf4)
67		c	44.36(25)	9.60(86)	0.071(12)	115(11)	10036.29(25)	···		0.157(20)	0.238(14)				
68		d	5552(78)	47.5(1.5)	0.091(80)	181.6(6.7)	12685(69)	···		3.90(33)	5.97(35)				
69		e	2.7955(20)	5.80(81)	0.09(28)	187(41)	10000.12(32)	···		0.0377(59)	0.0377(22)				
70	HD 76700	b	3.97097(23)	27.6(1.7)	0.095(75)[b]	30[b]	11213.32(67)	11213.89(12)		0.233(24)	0.0511(30)	6.9	1.0	35	Bu6
71	HD 80606	b	111.4487(32)	481.9(2.1)	0.9349(23)[g c]	301[c]	13199.0517(56)	13093.109(90)		4.31(35)	0.468(27)	5.4	1.0	46	Bu6 (Nf1)
72	HD 81040	b	1001.7(7.0)	168.0(9.0)	0.526(42)	81.3(7.2)	12504(12)	···		6.9(1.1)	1.94(11)	14	1.8	26	Sz6
73	HD 82943	b	219.50(13)[h]	59.3(5.2)[h]	0.39(26)[h]	121.0(3.1)[h]	···[h]	···[h]		1.81(21)	0.752(43)	8.0	1.4	165	Le5 (My4)
74		c	439.2(1.8)[h]	41.70(91)[h]	0.020(98)[h]	260(10)[h]	···[h]	···[h]		1.74(19)	1.194(69)				
75	HD 83443	b	2.985698(57)	56.2(1.7)	0.012(23)[b]	117[b]	11211.79(69)	11211.565(25)		0.398(35)	0.0406(23)	9.0	0.99	51	Bu6 (My4)
76	HD 86081	b	2.13750(20)	207.70(80)	0.0080(40)	251(40)	13694.80(30)	···	···	1.5	0.0346	3.2	0.81	26	Jh6
77	HD 88133	b	3.41587(59)	36.1(3.0)	0.133(72)[b]	349[b]	13016.31(32)	13013.705(95)		0.299(33)	0.0472(27)	6.2	0.96	21	Bu6

Table 3—Continued

	Planet		Per (d)	K (m s^{-1})	e	ω (deg)	$T_{\rm p}$ (JD-2440000)	$T_{\rm t}$ (JD-2440000)	trend (m s^{-1}yr^{-1})	$M \sin i$ ($M_{\rm Jup}$)	a (AU)	r.m.s. (m s^{-1})	$\sqrt{\chi^2_\nu}$	$N_{\rm obs}$	ref.[a] (alt.)
78	HD 89307	b	2900(1100)[d]	37.2(3.9)[d]	0.01(16)[b d]	353[b]	12520(230)	12800(260)		2.61(37)	3.9(1.3)	14	1.2	12	Bu6
79	HD 89744	b	256.80(13)	267.3(5.0)	0.6770(72)	194.4(1.2)	11505.33(39)	11487.03(76)	7.7(1.4)	8.58(71)	0.934(54)	16	1.3	50	Bu6 (K0)
80	HD 92788	b	325.81(26)	106.0(1.7)	0.334(11)	276.4(2.8)	10759.2(2.7)	10585.3(2.4)		3.67(30)	0.965(56)	7.9	1.0	58	Bu6 (My4)
81	HD 93083	b	143.58(60)	18.30(50)	0.140(30)	333.5(7.9)	13181.7(3.0)	···		0.368(54)	0.477(28)	2.0	···	16	Lv5
82	BD -10°3166	b	3.48777(11)	60.9(1.4)	0.019(23)[b]	334[b]	11171.22(69)	11168.832(31)	1.97(69)	0.458(39)	0.0452(26)	5.7	0.84	31	Bu6
83	47 UMa	b	1089.0(2.9)	49.3(1.2)	0.061(14)	172(15)	10356(34)	···		2.63(23)	2.13(12)	7.4	1.0	90	Fi2 (Nf4)
84		c	2594(90)[d]	11.1(1.1)[d]	0.00(12)[d]	127(56)	11360(500)	···		0.79(13)	3.79(24)				
85	HD 99109	b	439.3(5.6)	14.1(2.2)	0.09(16)[b]	256[b]	11310(80)	11110(35)		0.502(70)	1.105(65)	6.3	0.87	41	Bu6
86	83 Leo B	b	17.0431(47)	9.8(1.0)	0.254(92)	219(22)	10468.7(1.4)	10463.78(80)	1.29(21)	0.109(13)	0.1232(71)	3.6	0.80	51	Bu6
87	GJ 436	b	2.643943(84)	18.3(1.0)	0.207(52)	357(24)	11551.69(11)	11549.557(68)		0.0673(65)	0.0278(16)	4.9	0.79	55	Bu6
88	HD 101930	b	70.46(18)	18.10(40)	0.110(20)	251(11)	13145.0(2.0)	···		0.299(43)	0.302(17)	1.8	···	16	Lv5
89	HD 102117	b	20.8133(64)	11.98(95)	0.121(82)[b]	279[b]	10942.2(2.6)	10931.1(1.0)		0.172(20)	0.1532(88)	3.8	0.75	44	Bu6 (Lv5)
90	HD 102195	b	4.1150(10)	64	0.060(30)	110(10)	13731.70(50)	···		0.48	0.049	···	···		Ge5
91	HD 104985	b	198.20(30)	161.0(2.0)	0.030(20)	310(30)	11990(20)	···		6.33(91)	0.779(45)	24	3.2	26	St3
92	HD 106252	b	1516(26)	152(21)	0.586(65)	294.9(6.2)	10385(27)	9244(51)		7.10(65)	2.60(15)	9.1	0.78	15	Bu6 (Pr3)
93	HD 107148	b	48.056(57)	10.9(2.0)	0.05(17)[b]	75[b]	-31(12)	-29(12)	1.03(51)	0.210(36)	0.269(16)	4.4	1.4	35	Bu6
94	HD 108147	b	10.8985(45)	25.1(6.1)	0.53(12)	308(24)	10828.86(71)	10820.7(1.5)		0.261(40)	0.1020(59)	12	1.1	54	Bu6 (Pp2)
95	HD 108874	b	395.27(92)	37.91(95)	0.068(24)	250(35)	9739(38)	···		1.37(12)	1.055(61)	3.7	0.74	49	Vo5
96		c	1599(46)	18.35(86)	0.253(42)	20(100)	9590(110)	···		1.02(10)	2.68(17)				
97	HD 109749	b	5.23947(56)	28.58(87)	0[c]	0[c]	13014.91(85)	···		0.277(24)	0.0629(36)	2.7	0.59	21	Fi6
98	HD 111232	b	1143(14)	159.3(2.3)	0.200(10)	98.0(6.0)	11230(20)	···		6.84(98)	1.97(12)	7.5	···	38	My4
99	HD 114386	b	938(16)	34.3(1.6)	0.230(30)	273(14)	10454(43)	···		1.34(20)	1.71(10)	10	···	58	My4
100	HD 114762	b	83.8881(86)	615.2(6.7)	0.3359(91)	201.7(1.4)	9805.36(34)	9788.23(29)		11.68(96)	0.363(21)	24	1.1	45	Bu6 (Lt9)
101	HD 114783	b	496.9(2.3)	29.36(83)	0.085(33)	93(25)	10840(37)	10836.0(7.6)	2.95(40)	1.034(89)	1.169(68)	4.7	1.1	54	Bu6
102	HD 114729	b	1114(15)	18.8(1.3)	0.167(55)	93(30)	10520(67)	10515(21)		0.95(10)	2.11(12)	4.9	0.95	42	Bu6
103	70 Vir	b	116.6884(44)	316.3(1.7)	0.4007(35)	358.71(54)	7239.82(21)	7138.27(21)		7.49(61)	0.484(28)	7.4	1.0	74	Bu6 (Nf4)
104	HD 117207	b	2597(41)	26.60(93)	0.144(35)	73(16)	10630(120)	10723(41)		1.88(17)	3.79(22)	4.4	0.84	43	Bu6
105	HD 117618	b	25.827(19)	12.8(2.2)	0.42(17)	254(19)	10832.2(1.8)	10821.8(2.4)		0.178(21)	0.176(10)	5.5	0.79	57	Bu6
106	HD 118203	b	6.13350(60)	217.0(3.0)	0.309(14)	155.7(2.4)	13394.230(30)	···	49.7(5.7)	2.14(31)	0.0703(41)	18	···	43	Da6
107	τ Boo	b	3.312463(14)	461.1(7.6)	0.023(15)[b]	188[b]	6957.81(54)	6956.916(28)	-18.7(1.1)	4.13(34)	0.0481(28)	62	1.7	98	Bu6
108	HD 121504	b	63.330(30)	55.80(90)	0.030(10)	265(12)	11450.0(2.0)	···		1.22(17)	0.329(19)	12	···	100	My4
109	HD 128311	b	458.6(6.8)	66.8(8.7)	0.25(10)	111(36)	10211(76)	···		2.19(20)	1.100(65)	18	1.9		Vo5
110		c	928(18)	76.2(4.6)	0.170(90)	200(150)	10010(400)	···		3.22(49)	1.76(11)				
111	HD 130322	b	10.70875(94)	109.6(4.2)	0.025(32)[b]	149[b]	212.9(2.1)	211.2(1.1)		1.089(98)	0.0910(53)	11	2.4	12	Bu6 (U0)
112	23 Lib	b	258.31(16)	50.03(54)	0.243(11)	358.3(3.7)	10331.7(2.2)	10119.4(1.8)	2.91(22)	1.62(13)	0.820(47)	4.0	0.89	90	Bu6
113	HD 136118	b	1193.1(9.7)	212.8(5.8)	0.351(25)	311.4(3.1)	10598(13)	9734(24)		12.0(1.0)	2.37(14)	22	1.2	37	Bu6
114	GJ 581	b	5.3660(10)	13.20(40)	0[c]	0[c]	11004.300(60)	···		0.0521	0.0406(23)	2.5	···	20	Bf5
115	ι Dra	b	511.098(89)	307.6(2.3)	0.7124(39)	91.58(81)	12014.59(30)	12014.32(19)	-18.1(1.1)	8.82(72)	1.275(74)	14	1.9	119	Bu6

Table 3—Continued

	Planet		Per (d)	K ($\mathrm{m\ s^{-1}}$)	e	ω (deg)	$T_{\rm p}$ (JD-2440000)	$T_{\rm t}$ (JD-2440000)	trend ($\mathrm{m\ s^{-1} yr^{-1}}$)	$M \sin i$ ($\mathrm{M_{Jup}}$)	a (AU)	r.m.s. ($\mathrm{m\ s^{-1}}$)	$\sqrt{\chi^2_\nu}$	$\mathrm{N_{obs}}$	ref.[a] (alt.)
116	HD 137510	b	804.9(5.0)	418(31)	0.359(28)	31.0(3.8)	11762(27)	11851.3(9.4)		22.7(2.4)	1.91(11)	17	1.8	10	Bu6 (Ed4)
117	HD 330075	b	3.387730(80)	107.00(70)	0[c]	0[c]	12878.8150(30)	· · ·		0.624(88)	0.0392(23)	2.0	· · ·	21	Pp4
118	HD 141937	b	653.2(1.2)	234.5(6.4)	0.410(10)	187.72(80)	11847.4(2.0)	· · ·		9.7(1.4)	1.517(88)	8.7	1.6	81	U2
119	HD 142415	b	386.3(1.6)	51.3(2.3)	0.500[c]	255.0(4.0)	11519.0(4.0)	· · ·		1.69(25)	1.069(62)	11	· · ·	137	My4
120	ρ CrB	b	39.8449(63)	64.9(2.4)	0.057(28)[b]	303[b]	10563.2(4.1)	10539.58(35)		1.093(98)	0.229(13)	6.9	0.97	26	Bu6 (Ny7)
121	HD 142022	b	1928(46)	92(65)	0.53(20)	170.0(9.0)	10941(75)	· · ·		4.5(3.4)	2.93(18)	10	· · ·	76	Eg5
122	14 Her	b	1754.0(3.2)	90.7(1.0)	0.3872(94)	19.6(1.7)	11368.4(5.9)	11530.0(4.9)		4.98(41)	2.85(16)	5.6	1.4	49	Bu6 (Nf4)
123	HD 147513	b	528.4(6.3)	29.3(1.8)	0.260(50)	282.0(9.0)	11123(20)	· · ·		1.18(19)	1.310(77)	5.7	· · ·	30	My4
124	HD 149026	b	2.87598(14)	40.4(2.9)	0[c]	0[c]	13317.87(52)	13527.08746(88)[i]		0.337(36)	0.0432(25)	5.6	1.1	18	Cb6 (St5)
125	HD 150706	b	264.9(5.8)	33.0(4.0)	0.38(12)	178(32)	11580(26)	· · ·		0.95(22)	0.802(48)	6.8	· · ·	20	U3b (My3)
126	HD 149143	b	4.07(70)	149.6(3.0)	0[c]	0[c]	13483.9(1.2)	· · ·	10.0(2.0)	1.33(11)	0.0531(81)	4.7	1.1	17	Fi6 (Da6)
127	HD 154857	b	398.5(9.0)	52.0(5.0)	0.510(60)	50(11)	11963(10)	· · ·	-14.3(3.5)	1.85(16)	1.132(69)	3.2	0.87	18	MC4
128	μ Ara	b	630.0(6.2)	37.4(1.6)	0.271(40)	259.8(7.4)	10881(28)	10596(18)		1.67(17)	1.510(88)	4.7	1.1	108	Bu6 (Sn4b)
129		c	2490(100)	18.1(1.1)	0.463(53)	183.8(7.9)	11030(110)	10750(110)		1.18(12)	3.78(25)				
130		d	9.550(30)	4.10(20)	0.000(20)	4.0(2.0)	13168.940(50)	· · ·		0.0471	0.0924(53)	0.90	· · ·	24	Sn4b
131	HD 162020	b	8.428198(56)	1813.0(4.0)	0.2770(20)	28.40(23)	11990.6770(50)	· · ·		15.0(2.1)	0.0751(43)	8.1	1.2	30	U2
132	HD 164922	b	1155(23)	7.3(1.2)	0.05(14)[b]	195[b]	11100(280)	10780(68)		0.360(46)	2.11(13)	3.7	0.60	64	Bu6
133	HD 168443	b	58.11055(86)	475.8(1.6)	0.5296(32)	172.68(94)	10047.454(34)	10042.919(43)		8.01(65)	0.300(17)	5.9	1.3	106	Bu6 (U2)
134		c	1764.3(2.4)	297.4(1.2)	0.2175(15)	64.37(21)	10255.8(4.6)	10335.6(2.7)		18.1(1.5)	2.92(17)				
135	HD 168746	b	6.4040(14)	28.6(1.7)	0.107(80)[b]	17[b]	11757.83(47)	11758.92(19)		0.248(23)	0.0659(38)	3.9	0.79	16	Bu6 (Pp2)
136	HD 169830	b	225.62(22)	80.70(90)	0.330(20)	148.0(2.0)	11923.0(1.0)	· · ·		2.9(1.3)	0.817(47)	8.9		112	My4
137		c	2100(260)	54.3(3.6)	0.33(33)	252.0(8.0)	12516(25)	· · ·		4.1(1.6)	3.62(43)				
138	TrES-1		3.0300650(80)	115.2(6.2)	0[c j]	· · ·	· · ·	13186.80600(20)[i]		0.759	0.0394(23)	14	· · ·	8	As4
139	HD 177830	b	410.1(2.2)	32.64(98)	0.096(48)[b]	189[b]	10254(42)	10154.4(9.1)		1.53(13)	1.227(71)	6.2	1.0	54	Bu6
140	HD 178911 B	b	71.511(11)	346.9(4.2)	0.139(14)	172.3(5.0)	11378.23(83)	11364.97(33)		7.35(60)	0.345(20)	7.7	1.7	14	Bu6 (Z2)
141	HD 179949	b	3.092514(32)	112.6(1.8)	0.022(15)[b]	192[b]	11002.36(44)	11001.510(20)		0.916(76)	0.0443(26)	12	1.1	88	Bu6
142	HD 183263	b	635.4(3.9)	87.3(3.2)	0.363(21)	231.5(5.7)	12103.0(7.5)	11910(11)	-25.5(1.6)	3.82(34)	1.525(88)	8.4	1.8	34	Bu6
143	16 Cyg B	b	798.5(1.0)	50.5(1.6)	0.681(17)	85.8(2.4)	6549.1(6.6)	6546.3(6.4)		1.68(15)	1.681(97)	7.3	0.99	95	Bu6
144	HD 187123	b	3.096598(27)	70.0(1.0)	0.023(15)[b]	17[b]	10806.75(39)	10807.363(16)	-7.33(29)	0.528(44)	0.0426(25)	5.5	1.2	65	Bu6 (Nf4)
145	HD 187085	b	1147.0(4.0)	26(10)	0.75(10)	93(20)	10910(110)	· · ·	1.30(10)	0.98(43)	2.26(13)	6.0	1.2	33	Jo6
146	HD 188015	b	461.2(1.7)	37.6(1.2)	0.137(26)	222(10)	11787(17)	11634.4(5.7)	2.64(54)	1.50(13)	1.203(70)	4.3	0.93	44	Bu6
147	HD 189733	b	2.21900(50)	205.0(6.0)	0[c]	· · ·	· · ·	13629.38900(40)		1.15(17)	0.0312(18)	15	· · ·		Bc5
148	HD 190228	b	1146(16)	91.0(5.0)	0.499(30)	100.7(3.0)	11236(25)	· · ·		4.49(70)	2.25(13)	8.0	0.99	51	Pr3
149	HD 190360	b	2891(85)	23.50(50)	0.360(30)	12.4(9.3)	10630(100)	· · ·		1.55(14)	3.99(25)	3.5	0.88	87	Vo5 (Nf3)
150		c	17.100(15)	4.6(1.1)	0.01(10)	154(32)	10000.07(90)	· · ·		0.0587(78)	0.1303(75)				
151	HD 192263	b	24.3556(46)	51.9(2.6)	0.055(39)[b]	200[b]	10994.3(3.9)	10987.22(39)		0.641(61)	0.1532(88)	7.7	0.93	31	Bu6 (Sn3)
152	HD 195019	b	18.20132(39)	271.5(1.5)	0.0138(44)	231(20)	11015.5(1.1)	11008.449(40)		3.69(30)	0.1388(80)	16	1.5	154	Bu6
153	HD 196050	b	1378(21)	49.7(2.0)	0.228(38)	187(12)	10843(56)	10573(42)		2.90(26)	2.54(15)	8.4	1.3	44	Bu6 (My4)
154	HD 202206	b	255.870(60)[k]	564.8(1.3)[k]	0.4350(10)[k]	161.18(30)[k]	· · · [k]	· · · [k]		17.3(2.4)	0.823(48)	9.6	1.5		Cr5
155		c	1383(18)[k]	42.0(1.5)[k]	0.267(21)[k]	79.0(6.7)[k]	· · · [k]	· · · [k]		2.40(35)	2.52(15)				

Table 3—Continued

	Planet		Per (d)	K (m s^{-1})	e	ω (deg)	$T_{\rm p}$ (JD-2440000)	$T_{\rm t}$ (JD-2440000)	trend (m s^{-1}yr^{-1})	$M \sin i$ ($M_{\rm Jup}$)	a (AU)	r.m.s. (m s^{-1})	$\sqrt{\chi^2_\nu}$	$N_{\rm obs}$	ref.[a] (alt.)
156	HD 208487	b	130.08(51)	19.7(3.6)	0.24(16)[b]	113[b]	10999(15)	10994(10)		0.520(82)	0.524(30)	8.2	1.0	35	Bu6
157	HD 209458	b	3.52474554(18)	84.27(94)	0[c] [l]	0[c]	12853.94426(14)	12854.82545(14)[i]		0.690(57)	0.0474(27)	5.0	0.97	64	W4 (Nf4)
158	HD 210277	b	442.19(50)	38.94(75)	0.476(17)	119.1(2.8)	10104.3(2.6)	10092.8(2.1)		1.29(11)	1.138(66)	3.8	0.90	69	Bu6 (Nf1b)
159	HD 212301	b	2.24572(28)	59.50(70)	0[c]	0[c]	13549.1950(40)	· · ·		0.396	0.0341(20)	6.7	· · ·	23	LC5
160	HD 213240	b	882.7(7.6)	96.6(2.0)	0.421(15)	201.0(3.2)	11499(12)	11347.7(9.4)		4.72(40)	1.92(11)	5.0	0.75	30	Bu6 (Sn1)
161	GJ 876	b	60.940(13)[m]	212.60(76)[m]	0.0249(26)[m]	175.7(6.0)[m]	· · · [m]	· · · [m]		1.93(27)	0.208(12)	4.6	1.2	155	R5 (De8)
162		c	30.340(13)[m]	88.36(72)[m]	0.2243(13)[m]	198.30(90)[m]	· · · [m]	· · · [m]		0.619(88)	0.1303(75)				
163		d	1.937760(70)[m]	6.46(59)[m]	0[c] [m]	· · · [m]	· · · [m]	· · · [m]		0.0185(31)	0.0208(12)				
164	τ^1 Gru	b	1311(49)	19.6(1.5)	0.070(78)[b]	100[b]	10870(210)	10837(53)		1.26(13)	2.56(17)	6.3	1.1	58	Bu6
165	ρ Ind	b	1353(25)	39.0(1.0)	0.319(25)	67.7(8.4)	10605(29)	10647(24)		2.26(19)	2.54(15)	5.3	1.0	39	Bu6 (My4)
166	HD 216770	b	118.45(55)	30.9(1.9)	0.370(60)	281(10)	12672.0(3.5)	· · ·		0.65(11)	0.456(26)	7.8	· · ·	16	My4
167	51 Peg	b	4.230785(36)	55.94(69)	0.013(12)[b]	58[b]	10001.51(61)	10001.881(18)	-1.64(16)	0.472(39)	0.0527(30)	7.0	0.88	256	Bu6 (Nf4)
168	HD 217107	b	7.12690(22)	140.7(2.6)	0.130(20)	21.1(7.6)	-1.58(17)	· · ·		1.41(12)	0.0748(43)	5.1	1.1	63	Vo5 (Nf1b)
169		c	3200(1000)	34(20)	0.55(20)	164(30)	11030(300)	· · ·		2.21(66)	4.3(1.2)				
170	γ Cep	b	905.0(3.1)	27.5(1.5)	0.120(50)	50(26)	-878(67)	· · ·		1.77(28)	2.14(12)	15	1.2	111	H3
171	HD 222582	b	572.38(61)	276.3(7.0)	0.725(12)	319.01(87)	10706.7(2.8)	10199.8(3.8)		7.75(65)	1.347(78)	3.9	0.83	37	Bu6
172	HD 224693	b	26.730(20)	40.2(2.0)	0.050(30)	6(200)	13193.9(3.0)	· · ·	· · ·	0.71	0.192	4.07	0.85	24	Jh6

[a]References are encoded as follows: As4: Alonso et al. (2004); Bc5: Bouchy et al. (2005b); Bf5: Bonfils et al. (2005); Bu6: This work; Cb6: Charbonneau et al. (2006); Cc4: Cochran et al. (2004); Cr5: Correia et al. (2005); Da6: da Silva et al. (2006); De8: Delfosse et al. (1998); Ed4: Endl et al. (2004); Ed6: Endl et al. (2006); Eg5: Eggenbereger et al. (2005); Fi2: Fischer et al. (2002); Fi5: Fischer et al. (2005); Fi6: Fischer et al. (2006); Fi6: D. Fischer et al. (2006), in prep.; Ga5: Galland et al. (2005); Ge5: Ge et al. (2005), http://vo.obspm.fr/exoplanets/encyclo/planet.php?p1=HD+102195&p2=b; H0: Hatzes et al. (2000); H3: Hatzes et al. (2003); Jo6: Jones et al. (2006); Jh6: J. A. Johnson et al. (2006) in prep.; K0: Korzennik et al. (2000); LC5: Lo Curto (2005); Le5: Lee et al. (2005); Lt9: Latham et al. (1989); Lv5: Lovis et al. (2005); MA4: McArthur et al. (2004); MC4: McCarthy et al. (2004), Mo5: Moutou et al. (2005); My3: http://obswww.unige.ch/~naef/planet/geneva_planets.html; My4: Mayor et al. (2004); Nf1:Naef et al. (2001a); Nf1b: Naef et al. (2001b); Nf3: Naef et al. (2003); Nf4: Naef et al. (2004); Ny7: Noyes et al. (1997); Pp2: Pepe et al. (2002); Pp4: Pepe et al. (2004); Pr3: Perrier et al. (2003); Q0: Queloz et al. (2000); R5: Rivera et al. (2005); Sn1: Santos et al. (2001); Sn3: Santos et al. (2003); Sn4b: Santos et al. (2004); St3: Sato et al. (2003); St5: Sato et al. (2005); Sz6: Sozzetti et al. (2006); T6: Tinney et al. (2006); Sw3: Setiawan et al. (2003); Sw5: Setiawan et al. (2005); U0: Udry et al. (2000); U2: Udry et al. (2002); U3: Udry et al. (2003); U3b: Udry, Mayor, & Queloz (2003); U6: Udry et al. (2006); Vo5: Vogt et al. (2005); W4:Wittenmyer et al. (2004); Wr6: J. T. Wright et al. (2006) in prep; Z2: Zucker et al. (2002); Z4: Zucker et al. (2004)

[b]When the uncertainty in e is comparable to e, uncertanties in ω and e become non-gaussian. See § 4.

[c]Parameter held fixed in fit.

[d]This parameter is highly uncertain with a non-Gaussian distribution of possible values and high covarience with other parameters.

[e]The period of HD 37124 c is unclear. An alternative interpretation to the data with component 'c' having a period of 29.3 days and slightly different parameters for the other two components is plausible. See Vogt et al. (2005) for details.

[f]The mass of HD 47536 is ill-determined. The solution here is for $M = 1.1 M_\odot$

[g]Eccentricity held fixed in fit. The quoted error in e represents the change in the e from the best fit required to increase the best-fit χ^2 by 1.

[h]The exoplanets in this system have significant interactions, which renders Keplerian orbital elements inadequate for describing their orbits, since these elements are time-variable. Lee et al. (2005) report the mean anomoly of the inner and outer planets to be 356° and 227°, respectively, at a Julian Date of 2451185.1.

[i]This transit emphemeris is expressed as a Heliocentric Judian Day

[j]Charbonneau et al. (2005) find $e \cos \omega = 0.003 \pm 0.0019$

[k]The exoplanets in this system have significant interactions, which renders Keplerian orbital elements inadequate for describing their orbits, since these elements are time-variable. Correia et al. (2005) report the

nean longitude to be 266.23 ± 0.06 and 30.59 ± 2.84 for the inner and outer planets, respectively, at a Julian Date of 2452250.

[l] Laughlin et al. (2005) find e consistent with 0.

[m] The exoplanets in this system have significant interactions, which renders Keplerian orbital elements inadequate for describing their orbits, since these elements are time-variable. Rivera et al. (2005) report the nean anomoly of the b, c, and d components at JD 2452490.0 to be 175.5 ± 6.0, 308.5 ± 1.4, and 309.5 ± 5.1, respectively.

Table 4. Independent Orbital Solutions

Planet		Per (d)	K (m s^{-1})	e	ω (deg)	$T_{\rm p}$ (JD-2440000)	trend (m s^{-1}y^{-1})	$M \sin i$ ($M_{\rm Jup}$)	a (AU)	r.m.s. (m s^{-1})	$\sqrt{\chi^2_\nu}$	$N_{\rm obs}$	ref.[a]
HD 8574	b	277.55(77)	66(5)	0.288(53)	3.6(10.9)	111467.5(6.6)		2.11	0.77	13	1.4	41	Pr3
υ And	b	4.61712(9)	77.2(1.3)	0.02(23)	242(37)	10004.28(48)		0.75(1)	0.059	15	2.1	71	Nf4
	c	238.10(46)	63.0(1.7)	0.185(28)	214(11)	10159.4(8.0)		2.25(6)	0.821				
	d	1319(18)	63.8(2.3)	0.269(36)	248(11)	9963(53)		3.95(13)	2.57				
HD 10647	b	1040(37)	18(1)	0.18(8)	68(17)	12261(47)		0.91	2.1	8.2		72	My3
HD 13445	b	15.78(4)	380(1)	0.046(4)	270(4)	11146.7(2)	-131	4	0.11	7		61	Q0
ι Hor	b	311.3(1.3)	68(4)	0.22(6)	79(13)	11309(10)		2.24(13)	0.91	23.2	1.5	88	Nf1b
ϵ Eri	b	2502(20)	19.0(1.7)	0.608(41)	48.9(4.1)	9195(14)	0.42(20)	0.86		14		225	H0
HD 33636	b	2828(750)	168(15)	0.55(10)	340.2(6.1)	11211(22)		10.58	4.08	9	1.0	47	Pr3
HD 45350	b	962.1(4.4)	57.4(1.8)	0.764(11)	388.7(4.1)	11827.4(9.4)		1.82(14)	1.920(69)	9.05	1.16	73	Ed6
HD 50554	b	1293(37)	104(5)	0.501(30)	355.7(4.4)	11832(15)		5.16	2.41	11.8	1.3	41	Pr3
HD 52265	b	119.60(42)	42(1)	0.35(3)	211(6)	11422.3(1.7)		1.05(3)	0.5	7.3	0.84	71	Nf1b
HD 75289	b	3.5098(7)	54(1)	0.024(21)	50(49)	11355.91(48)		0.42	0.046	7.5		88	U0
55 Cnc	b	14.647(1)	78.3(1.8)	0.030(23)	63(12)	10000.80(48)		0.91(2)	0.115	9.0	1.4	48	Nf4
	d	4545(1421)	37.8(3.9)	0.24(13)	347(23)	10568(200)		2.89(47)	5.28				
HD 80606	b	111.81(23)	411(31)	0.927(12)	291.0(6.7)	11973.72(29)		3.90(9)	0.47	17.7		61	Nf1
HD 82943	b	435.1(1.4)	45.8(1.0)	0.18(4)	237(13)	11758(13)		1.84	1.18	6.8		142	My4
	c	219.4(2)	61.5(1.7)	0.38(1)	124(3)	12284(1)		1.85	0.75				
HD 83443	b	2.98565(3)	58.1(4)	0.013(13)	11(11)	11497.5(3)		3.58	0.96	9.0		257	My4
HD 89744	b	256.0(7)	257(14)	0.70(2)	195(3)	10994(2)		7.2	0.88	20.5	1.6	88	K0
HD 92788	b	325.0(5)	106.2(1.8)	0.35(1)	279(3)	11090.3(3.5)		3.58	0.96		8.0	55	My4
47 UMa	b	1100.8(7.2)	53.6(1.9)	0.097(39)	300(20)	12915(64)		2.76(10)	2.11	7.4	1.1	44	Nf4
HD 102117	b	20.67(4)	10.2(4)	0.00(7)	162.8(3.0)	13100.1(1)		0.14	0.149	0.9		13	Lv5
HD 106252	b	1600(18)	147(4)	0.471(28)	292.2(3.2)	11871(17)		7.56	2.7	10.5	1.1	40	Pr3
HD 108147	b	10.901(1)	36(1)	0.498(25)	319.0(3.0)	11591.6(1)		0.4	0.104	9.2		118	Pp2
70 Vir	b	116.689(11)	314.1(2.0)	0.397(5)	359.40(92)	8990.39(33)		6.56(4)	0.456	6.1	0.93	35	Nf4
HD 130322	b	10.720(7)	115(2)	0.044(18)	204(23)	11287.38(68)		1.02	0.088	15.4		118	U0
HD 137510	b	798.2(1.4)	531.6(5.3)	0.402(8)	30.8(1.2)	12582.01(2.6)		26.0(1.4)	1.85(5)	15		76	Ed4
14 Her	b	1796.4(8.3)	90.3(1.0)	0.338(11)	22.6(2.0)	9582(12)	···	4.74(6)	2.8	11.3	1.6	119	Nf4
HD 149143	b	4.088(6)	163(8)	0.08(4)	42(35)	13588.00(40)	···	1.36	0.052	13.3	···	8	Da5
HD 168746	b	6.403(1)	27(1)	0.081(29)	16(21)	11994.7(4)		0.23	0.065	9.8		154	Pp2
HD 178911	b	71.487(18)	339.3(3.1)	0.1243(75)	169.8(3.6)	10305.70(62)	···	6.292(59)	···	11	···	51	Z2
HD 187123	b	3.0966(1)	70.7(1.7)	0[a]	0[a]	11010.972(27)	-8.9(9)	0.52(1)	0.042	10.5	1.2	57	Nf4
HD 190360	b	3902(1758)	20(3)	0.48(20)	1(13)	10557(89)	···	1.33(19)	4.8	9.3	1.3	69	Nf3
HD 192263	b	24.348(5)	61(1)	0[a]	0[a]	11979.28(8)	···	0.72	0.15	12.5	···	182	Sn3
HD 196050	b	1321(54)	55.0(6.2)	0.3[b]	147(12)	12045(66)		3.02	2.43	7.2		31	My4
HD 209458	b	3.5246(1)	85.1(1.0)	0[b]	0[b]	12765.790(21)		0.699(7)	0.048	14.9	1.5	187	Nf4
HD 210277	b	436.6[a]	52(9)	0.342(55)	104(13)	11410(13)	···	1.73(29)	···	7.5	0.82	42	Nf1b
HD 213240	b	951(42)	91(3)	0.45(4)	214(7)	11520(11)		4.5	2.03	11		72	Sn1
ρ Ind	b	1256(35)	34.6(5.7)	0.29(12)	63(22)	10693(13)	···	1.82	2.32	7.2	···	21	My4
51 Peg	b	4.23077(4)	57.3(8)	0[b]	0[b]	12497.000(22)		0.468(7)	0.052	11.8	1.64	153	Nf4
HD 217107	b	7.1260(5)	140(1)	0.126(9)	24(4)	11452.388(79)	43.3	1.275(13)	···	7.0	···	63	Nf1b

[a]References are encoded in Table 3.

[b]Parameter held fixed in fit.

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